

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------|----------|---------|-----------|-----------|------------|-------------|---------------|---------------|-----------|-----------|---------------|-----------|-----------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|----|------------|-----|------|-----|----------|---------|-------|-----|-----|-------|-----|-----|-----|------|----|------------|-----|------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|-----------|-----|------|-----|----------|---------|---------|-----|-----|---------|-----|-----|-----|------|
| 1.6 | Layer 0 Silicon Detector | 11/3/03 | 7/21/05 | \$610,803 | \$205,512 | \$537,366 | \$1,353,681 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Notes</div> <div>WBS Definition- This summary task covers the effort to develop, build, test, and install the Layer 0 silicon tracker for the D0 Run 2b upgrade project. The detector will be inserted inside the existing D0 silicon detector to provide an additional silicon layer closer to the beam. This will improve efficiency and detached-vertex resolution, as well as provide a hedge against future degradation of the existing silicon detector, thus extending its useful life.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1 | Sensors | 11/3/03 | 7/8/05 | \$163,000 | \$25,600 | \$13,696 | \$202,296 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Notes</div> <div>WBS Definition- This summary element includes the development and procurement of commercial silicon sensors, sensor probing and acceptance testing, radiation testing, and vendor qualification and monitoring.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.1 | Probe Stations Ready | 11/3/03 | 11/3/03 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Notes</div> <div>WBS Definition- Milestone: Probe stations to be used for sensor testing at universities and Fermilab are setup and ready for use.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.2 | Design short sensors | 12/17/03 | 1/23/04 | \$0 | \$0 | \$4,336 | \$4,336 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>1</td><td>MechEngF</td><td>0.1</td><td>16 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$816</td><td>\$0</td><td>\$0</td><td>\$816</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr><tr><td>17</td><td>PhysicistF</td><td>0.1</td><td>16 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr><tr><td>21</td><td>DesignerF</td><td>0.5</td><td>80 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$3,520</td><td>\$0</td><td>\$0</td><td>\$3,520</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr></table> <div>Notes</div> <div>WBS Definition- Finalize design and layout specifications for production short sensors, based on run 2b prototype results.</div> <div>M&S BOE- n/a</div> <div>Labor BOE- 50% of a designer for a month to prepare final short sensor drawings and 10% each of a physicist and mechanical engineer to check and review. The estimate of 4 weeks is based on the prototyping specifications which have already been done for Run2b. Done in parallel with long sensor design.</div> | | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 1 | MechEngF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | 17 | PhysicistF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | 21 | DesignerF | 0.5 | 80 h | 0 w | 12/17/03 | 1/23/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MechEngF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | PhysicistF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | DesignerF | 0.5 | 80 h | 0 w | 12/17/03 | 1/23/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.3 | Design long sensors | 12/17/03 | 1/23/04 | \$0 | \$0 | \$4,336 | \$4,336 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>1</td><td>MechEngF</td><td>0.1</td><td>16 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$816</td><td>\$0</td><td>\$0</td><td>\$816</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr><tr><td>17</td><td>PhysicistF</td><td>0.1</td><td>16 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr><tr><td>21</td><td>DesignerF</td><td>0.5</td><td>80 h</td><td>0 w</td><td>12/17/03</td><td>1/23/04</td><td>\$3,520</td><td>\$0</td><td>\$0</td><td>\$3,520</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr></table> <div>Notes</div> <div>WBS Definition- Finalize design and layout specifications for production of long sensors, based on run 2b prototype results.</div> <div>M&S BOE- n/a</div> <div>Labor BOE- 50% of a designer for a month to prepare final long sensor drawings and 10% each of a physicist and mechanical engineer to check and review. The estimate of 4 weeks is based on the prototyping specifications which have already been done for Run2b. Done in parallel with short sensor design.</div> | | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 1 | MechEngF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | 17 | PhysicistF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | 21 | DesignerF | 0.5 | 80 h | 0 w | 12/17/03 | 1/23/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MechEngF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | PhysicistF | 0.1 | 16 h | 0 w | 12/17/03 | 1/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | DesignerF | 0.5 | 80 h | 0 w | 12/17/03 | 1/23/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.4 | Vendor RFQ | 1/26/04 | 2/6/04 | \$0 | \$0 | \$264 | \$264 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>12</td><td>ElecTechSF</td><td>0.1</td><td>8 h</td><td>0 w</td><td>1/26/04</td><td>2/6/04</td><td>\$264</td><td>\$0</td><td>\$0</td><td>\$264</td><td>0 h</td><td>0 h</td><td>0 h</td><td>8 h</td></tr><tr><td>17</td><td>PhysicistF</td><td>0.2</td><td>16 h</td><td>0 w</td><td>1/26/04</td><td>2/6/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr></table> <div>Notes</div> <div>WBS Definition- Solicit and receive cost quotes from possible sensor vendors.</div> | | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 12 | ElecTechSF | 0.1 | 8 h | 0 w | 1/26/04 | 2/6/04 | \$264 | \$0 | \$0 | \$264 | 0 h | 0 h | 0 h | 8 h | 17 | PhysicistF | 0.2 | 16 h | 0 w | 1/26/04 | 2/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | ElecTechSF | 0.1 | 8 h | 0 w | 1/26/04 | 2/6/04 | \$264 | \$0 | \$0 | \$264 | 0 h | 0 h | 0 h | 8 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | PhysicistF | 0.2 | 16 h | 0 w | 1/26/04 | 2/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03

Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | |
|--|--|---------|---------|-----------|-----------|------------|------------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| "Vendor RFQ" continued | | | | | | | | | | | | | | |
| <div>Notes</div> <div>Labor BOE- 2 days of physicist time to prepare and respond to the RFQ, and a day of an electrical tech time for followup with vendors. Allow two weeks for vendor response.</div> <div>M&S BOE- n/a</div> | | | | | | | | | | | | | | |
| 1.6.1.5 | Conduct sensor production readiness review | 1/26/04 | 1/30/04 | \$0 | \$0 | \$1,020 | \$1,020 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 0.5 | 20 h | 0 w | 1/26/04 | 1/30/04 | \$1,020 | \$0 | \$0 | \$1,020 | 0 h | 0 h | 0 h | 20 h |
| 17 | PhysicistF | 1 | 40 h | 0 w | 1/26/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 18 | PhysicistU | 1 | 40 h | 0 w | 1/26/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| <div>Notes</div> <div>WBS Definition- Conduct and document results of production readiness review prior to Layer 0 sensors' release for procurement.</div> <div>Labor BOE- Two physicists and 50% of an mechanical engineer to review the final design prior to start of procurement, and document the results over the course of 1 week. Will be a relatively minimal review since the Layer 0 sensor design is derived from the already reviewed Layer 0/1 sensors for the Run 2b upgrade.</div> <div>M&S BOE- n/a</div> | | | | | | | | | | | | | | |
| 1.6.1.6 | Prepare sensor req and PO | 2/9/04 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 15 | ElecTechU | 0.1 | 24 h | 0 w | 2/9/04 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 24 h |
| 18 | PhysicistU | 0.1 | 24 h | 0 w | 2/9/04 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 24 h |
| <div>Notes</div> <div>WBS Definition-- Submit the requisition to the Fermilab business office and interact with the buyer and vendor to obtain a final tender for the sensor production order.</div> <div>Labor BOE-- It is expected that a physicist and an electrical tech will spend half a day per week on seeing the order through and interacting with the vendor and Fermilab purchasing dept..</div> <div>M&S BOE-- n/a</div> | | | | | | | | | | | | | | |
| 1.6.1.7 | Release Sensors for Production | 3/19/04 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | |
| <div>Notes</div> <div>WBS Definition- Milestone: The designs and specifications have been reviewed, a PO is in place, and the L0 sensors are released for production.</div> | | | | | | | | | | | | | | |
| 1.6.1.8 | Produce sensors | 3/22/04 | 9/22/04 | \$161,000 | \$0 | \$0 | \$161,000 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 51 | InKind | 161,000 | 161,000 | 0 w | 3/22/04 | 9/22/04 | \$161,000 | \$0 | \$0 | \$161,000 | | 0 | 0 | 161,000 |
| <div>Notes</div> <div>WBS Definition- Vendor production and testing/QA of Layer 0 silicon sensors</div> <div>Labor BOE- n/a</div> <div>M&S BOE- It is anticipated that these sensors will be procured from Hamamatsu. The sensors are very similar to the Layer 0/1 sensors that would have been procured for the upgrade Run2b detector. Based on a budgetary quote from Hamamatsu for prototype (not production) sensors for run 2b, the M&S cost for the layer 0 sensors is estimated at:</div> | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----------------------------|--|-------|--------|--------|-----------|------------|------------|
| "Produce sensors" continued | | | | | | | |
| | <u>Notes</u> | | | | | | |
| | NRE: \$65,000 48 sensors + 48 spares @ \$1000 per sensor = \$96,000 ----- Total cost: \$161,000 | | | | | | |
| | The contingency has been set to 100% because we don't have an official quote yet for the new sensors, and to take into account possible currency fluctuations. | | | | | | |

1.6.1.9

| Probe sensors (FNAL) | | | | 9/23/04 | 11/17/04 | \$500 | \$0 | \$1,088 | \$1,588 | | | | | |
|--|---------------|-------|------|---------|----------|----------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.1 | 32 h | 0 w | 9/23/04 | 11/17/04 | \$1,088 | \$0 | \$0 | \$1,088 | 0 h | 0 h | 0 h | 32 h |
| 17 | PhysicistF | 0.25 | 80 h | 0 w | 9/23/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 48 | MandS | 500 | 500 | 0 w | 9/23/04 | 11/17/04 | \$500 | \$0 | \$0 | \$500 | | 0 | 0 | 500 |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | |
| QC Testing done by D0 at Fermilab on a fraction of the production L0 sensors. We plan to perform two types of tests. Partial test consists of the visual inspection, IV and CV measurements. Full test adds extensive strip-by-strip measurement - strip leakage current, coupling capacitance, polysilicon resistor values. | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | |
| Probing will be done at Fermilab and universities. There will be a setup time of ~5 days for this test and then ~20 sensors will be probed at a rate of about 4 hours per sensor. Each of these sensors will have the full test done. The total probing time is estimated at 80 hours or 10 days by a physicist. The physicist is supported at the 10% level by a mechanical technician. | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | |
| \$500 is allocated for assorted probe station hardware. | | | | | | | | | | | | | | |

1.6.1.10

| Probe sensors (MRI) | | | | | | | 9/23/04 | 11/17/04 | \$500 | \$24,000 | \$0 | \$24,500 | | |
|---------------------|---------------|--------|--------|-------|---------|----------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 15 | ElecTechU | 1.5 | 480 h | 0 w | 9/23/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 480 h |
| 18 | PhysicistU | 0.5 | 160 h | 0 w | 9/23/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 51 | InKind | 24,500 | 24,500 | 0 w | 9/23/04 | 11/17/04 | \$24,500 | \$0 | \$0 | \$24,500 | | 0 | 0 | 24,500 |

Notes

WBS Definition-
QC Testing done by universities on the majority of the production L0 sensors. We plan to perform two types of tests. Partial test consists of the visual inspection, IV and CV measurements. Full test adds extensive strip-by-strip measurement - strip leakage current, coupling capacitance, polysilicon resistor values.

Labor BOE-
Probing will be done at Fermilab and universities. There will be a setup time of ~5 days (40 hrs) for this test and then ~75 sensors will be probed at a rate of about 6 hours per sensor. Each of these sensors will have the full test done. The total probing time is estimated at 440 hours +40 hrs setup, supervised half-time by a physicist.
\$50/hr x480 hrs=\$24,000 (ETU)

M&S BOE-
\$500 is allocated for miscellaneous probe station hardware.

1.6.1.11

| Long-term sensor tests | | | | 9/23/04 | | 7/8/05 | | \$500 | | \$0 | | \$2,652 | | \$3,152 | |
|------------------------|---------------|-------|-------|---------|---------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|--|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | |
| 9 | MechTechSF | 0.05 | 78 h | 0 w | 9/23/04 | 7/8/05 | \$2,652 | \$0 | \$0 | \$2,652 | 0 h | 0 h | 0 h | 78 h | |
| 17 | PhysicistF | 0.1 | 156 h | 0 w | 9/23/04 | 7/8/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 156 h | |
| 48 | MandS | 500 | 500 | 0 w | 9/23/04 | 7/8/05 | \$500 | \$0 | \$0 | \$500 | | 0 | 0 | 500 | |

Notes

WBS Definition-

A few sensors will be kept under test for an extended period, up to the time of detector completion, to search for any long-term degradation or fluctuations in performance.

Labor BOE-

Low-level effort (10%) of a physicist and technician time to periodically conduct and monitor tests, and review results.

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|----------|---------------|-----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|-----------|-----|------|-----|----------|----------|-----|-----|-----|-----|-----|-----|-----|------|----|------------|-----|------|-----|----------|----------|-----|-----|-----|-----|-----|-----|-----|------|----|--------|-------|-------|-----|----------|----------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| "Long-term sensor tests" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> M&S BOE- \$500 for assorted test hardware and consumables. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.12 | Irradiate test structures | 10/21/04 | 11/17/04 | \$500 | \$1,600 | \$0 | \$2,100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>15</td><td>ElecTechU</td><td>0.2</td><td>32 h</td><td>0 w</td><td>10/21/04</td><td>11/17/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>32 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.2</td><td>32 h</td><td>0 w</td><td>10/21/04</td><td>11/17/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>32 h</td></tr><tr><td>51</td><td>InKind</td><td>2,100</td><td>2,100</td><td>0 w</td><td>10/21/04</td><td>11/17/04</td><td>\$2,100</td><td>\$0</td><td>\$0</td><td>\$2,100</td><td></td><td>0</td><td>0</td><td>2,100</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 15 | ElecTechU | 0.2 | 32 h | 0 w | 10/21/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | 18 | PhysicistU | 0.2 | 32 h | 0 w | 10/21/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | 51 | InKind | 2,100 | 2,100 | 0 w | 10/21/04 | 11/17/04 | \$2,100 | \$0 | \$0 | \$2,100 | | 0 | 0 | 2,100 | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | ElecTechU | 0.2 | 32 h | 0 w | 10/21/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.2 | 32 h | 0 w | 10/21/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 2,100 | 2,100 | 0 w | 10/21/04 | 11/17/04 | \$2,100 | \$0 | \$0 | \$2,100 | | 0 | 0 | 2,100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Irradaiton tests done at radiation facility to assure performance of detectors. Labor BOE- \$50/hr x 32hrs=\$1600 (ETU) A physicist oversees the effort at the 20% level. M&S BOE- \$500 for assorted test hardware and consumables. Total M&S: \$1600 + \$500 = \$2100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.1.13 | All Sensors Delivered and Tested | 11/17/04 | 11/17/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Milestone: All L0 sensors delivered, tested, and ready for assembly into modules. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2 | Readout Electronics | 11/3/03 | 6/9/05 | \$284,082 | \$90,880 | \$167,108 | \$542,070 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- This summary element includes the development, procurement, and testing of readout hybrids, cabling, junction cards, adaptor cards, interface boards, and power supplies, as well as improvements to selected elements of the front-end DAQ system. SVX4 chips are presumed to be alaready available from existing quantities delivered as part of the Run 2b upgrade project. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.1 | SVX4 Chips Available | 1/5/04 | 1/5/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Milestone: Tested SVX4 chips made available from existing wafers produced for Run IIb. 96 chips required + 384 spares = 480 chips total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.2 | SASEQ Test Stands Available | 11/3/03 | 11/3/03 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Milestone: Test stands for production testing using stand alone sequencers (SASEQs) available for use. This were made available throught the Run 2b upgrade project. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.3 | Hybrids | 12/17/03 | 1/19/05 | \$50,100 | \$20,200 | \$19,772 | \$90,072 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- This is a summary task that includes the development, procurement, stuffing, wirebonding, and testing of all Layer 0 hybrid assemblies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|-----------|----------------|-------|-------|-------|----------|---------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| 1.6.2.3.1 | Design hybrids | | | | 12/17/03 | 1/30/04 | \$0 | \$3,000 | \$11,300 | \$14,300 | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 0.1 | 20 h | 0 w | 12/17/03 | 1/30/04 | \$1,020 | \$0 | \$0 | \$1,020 | 0 h | 0 h | 0 h | 20 h |
| 4 | ElecEngF | 0.5 | 100 h | 0 w | 12/17/03 | 1/30/04 | \$5,500 | \$0 | \$0 | \$5,500 | 0 h | 0 h | 0 h | 100 h |
| 13 | ElecTechF | 0.5 | 100 h | 0 w | 12/17/03 | 1/30/04 | \$3,900 | \$0 | \$0 | \$3,900 | 0 h | 0 h | 0 h | 100 h |
| 17 | PhysicistF | 0.25 | 50 h | 0 w | 12/17/03 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 50 h |
| 21 | DesignerF | 0.1 | 20 h | 0 w | 12/17/03 | 1/30/04 | \$880 | \$0 | \$0 | \$880 | 0 h | 0 h | 0 h | 20 h |
| 48 | MandS | 3,000 | 3,000 | 0 w | 12/17/03 | 1/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 |

Notes

WBS Definition-

The design and layout of Layer 0 hybrids.

L0 hybrid will interface 2 SVX4 chips to the outside electronics. The hybrid will provide power and control signals to the chips and will read out data. L0 hybrid has 2 SVX4 chips, 50-pin AVX connector and 28 SMT components. The hybrid design is based on thick film screen printing on beryllia substrate. Routing is performed via 3 layers of traces, one ground layer and one power layer. Schematics and layout of the hybrid is provided. The total number of dielectric and metal layers is 11. Several back side prints are necessary to compensate for possible warping.

M&S BOE

L0 hybrid layout and routing is performed by Wolf Electronics in Elgin IL. Typical charge is \$1500 per iteration of the design. We assume 2 iterations which was required for L1 prototype hybrids now produced. Total cost is \$3000.

Labor BOE-

Similar technology was used by CDF in Run2a so the estimates are supported by Run2a experience. Estimate of 5 weeks total -

2.5 weeks of ElecEngF and ~1 week of Physicist is based on the design of L1 prototype accomplished in 2001. 3 days of DesF is required to produce three drawings of the L0 hybrid and L0 module. L0 module composed of the sensor, analog cable and the hybrid.

| | | | | | | | | | | | | | | |
|-----------|--|-------|------|-------|--------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.3.2 | Conduct hybrid production readiness review | | | | | | 2/2/04 | 2/6/04 | \$0 | \$0 | \$1,100 | \$1,100 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 4 | ElecEngF | 0.5 | 20 h | 0 w | 2/2/04 | 2/6/04 | \$1,100 | \$0 | \$0 | \$1,100 | 0 h | 0 h | 0 h | 20 h |
| 17 | PhysicistF | 1 | 40 h | 0 w | 2/2/04 | 2/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 18 | PhysicistU | 1 | 40 h | 0 w | 2/2/04 | 2/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |

Notes

WBS Definition-

Conduct and document results of production readiness review prior to Layer 0 hybrids release for procurement.

Labor BOE-

Two physicists and 50% of an electrical engineer to review the final design prior to start of procurement, and document the results over the course of 1 week.

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|-----------|-----------------------|-------|------|-------|--------|---------|--------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.3.3 | Bid hybrid production | | | | | | 2/9/04 | 2/27/04 | \$0 | | \$0 | \$468 | \$468 | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 13 | ElecTechF | 0.1 | 12 h | 0 w | 2/9/04 | 2/27/04 | \$468 | \$0 | \$0 | \$468 | 0 h | 0 h | 0 h | 12 h |
| 17 | PhysicistF | 0.1 | 12 h | 0 w | 2/9/04 | 2/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |

Notes

WBS Definition-

Vendor qualification and selection for final L0 hybrids.

Labor BOE-

Physicist and electrical tech at the 10% level to verify funding and contact potential vendors and purchasers; Run2a/b experience

M&S BOE-

n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----------|---------------------------|--------|---------|--------|-----------|------------|------------|
| 1.6.2.3.4 | Prepare hybrid req and PO | 3/1/04 | 3/26/04 | \$0 | \$0 | \$312 | \$312 |

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|---------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 13 | ElecTechF | 0.05 | 8 h | 0 w | 3/1/04 | 3/26/04 | \$312 | \$0 | \$0 | \$312 | 0 h | 0 h | 0 h | 8 h |
| 17 | PhysicistF | 0.05 | 8 h | 0 w | 3/1/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |

Notes

WBS Definition--

Submit the requisition to the Fermilab business office and interact with the buyer and vendor to prepare a purchase order.

Labor BOE--

It is expected that a physicist and an electrical tech will spend about 1day each seeing the order through the procurement system to placement, and interacting with the vendor and Fermilab purchasing dept.

M&S BOE--

n/a

| | | | | | | | |
|-----------|--------------------------------|---------|---------|-----|-----|-----|-----|
| 1.6.2.3.5 | Release Hybrids for Production | 3/26/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 |
|-----------|--------------------------------|---------|---------|-----|-----|-----|-----|

Notes

WBS Definition--

Milestone: The designs and specifications have been reviewed, a PO is in place, and the L0 hybrids are released for production. The purchase order has been submitted to the vendor.

| | | | | | | | |
|-----------|-----------------|---------|--------|----------|-----|-----|----------|
| 1.6.2.3.6 | Produce hybrids | 3/29/04 | 7/6/04 | \$34,860 | \$0 | \$0 | \$34,860 |
|-----------|-----------------|---------|--------|----------|-----|-----|----------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|--------|--------|-------|---------|--------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 51 | InKind | 34,860 | 34,860 | 0 w | 3/29/04 | 7/6/04 | \$34,860 | \$0 | \$0 | \$34,860 | | | 0 | 0 |

Notes

WBS Definition--

Vendor production of hybrids.

Labor BOE-

n/a

M&S BOE-

48 hybrids + 48 spares at \$300 per hybrid = \$28,800

NRE and testing = \$6060

Total=\$34,860

| | | | | | | | |
|-----------|----------------------|--------|---------|-----|-----|---------|---------|
| 1.6.2.3.7 | Procure parts (FNAL) | 2/9/04 | 4/30/04 | \$0 | \$0 | \$3,192 | \$3,192 |
|-----------|----------------------|--------|---------|-----|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 4 | ElecEngF | 0.05 | 24 h | 0 w | 2/9/04 | 4/30/04 | \$1,320 | \$0 | \$0 | \$1,320 | 0 h | 0 h | 0 h | 24 h |
| 13 | ElecTechF | 0.1 | 48 h | 0 w | 2/9/04 | 4/30/04 | \$1,872 | \$0 | \$0 | \$1,872 | 0 h | 0 h | 0 h | 48 h |
| 17 | PhysicistF | 0.1 | 48 h | 0 w | 2/9/04 | 4/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |

Notes

WBS Definition--

Purchase of parts needed to stuff and wirebond the bare hybrids once they are received from the vendor.

Labor BOE-

5% of an electrical engineer and 10% of a physicist to specify the parts, and 10% of an electrical tech to work with Fresno on the procurement.

M&S BOE-

n/a (see Fresno task)

| | | | | | | | |
|-----------|------------------------|--------|---------|---------|---------|-----|----------|
| 1.6.2.3.8 | Procure parts (Fresno) | 2/9/04 | 4/30/04 | \$7,180 | \$4,800 | \$0 | \$11,980 |
|-----------|------------------------|--------|---------|---------|---------|-----|----------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|--------|--------|-------|--------|---------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 15 | ElecTechU | 0.2 | 96 h | 0 w | 2/9/04 | 4/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 96 h |
| 51 | InKind | 11,980 | 11,980 | 0 w | 2/9/04 | 4/30/04 | \$11,980 | \$0 | \$0 | \$11,980 | | | 0 | 0 |

Notes

WBS Definition--

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|--------|---------------|---------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|------------|------|------|-----|--------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|----------|-----|-------|-----|--------|---------|-------|-----|-----|-------|-----|-----|-----|-------|----|--------|-------|-------|-----|--------|--------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| "Procure parts (Fresno)" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> Purchase of parts needed to stuff and wirebond the bare hybrids once they are received from the vendor. (Fresno procurement.) Labor BOE- 20% of an ElecTech U to deal with the procurement (place the orders and followup on the status to ensure timely delivery). 96hrsx\$50/hr=\$4800 (ETU) M&S BOE- 96x\$20 = \$1920 (parts) (\$2430 +\$200) x 2 = \$5260 two reels of avx connectors (includes cost to remove pins near HV) ----- Total: \$7180 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.3.9 | Hybrid Boxes Available | 7/6/04 | 7/6/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Milestone: The boxes needed for shipping, functional testing, and burn-in of hybrids are available for use. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.3.10 | Test Hybrids | 7/7/04 | 1/19/05 | \$8,060 | \$12,400 | \$3,400 | \$23,860 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Summary task representing the testing of delivered production hybrids at universities and Fermilab. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.3.10.1 | Develop functionality test (Fresno) | 7/7/04 | 8/3/04 | \$0 | \$1,600 | \$0 | \$1,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>18</td><td>PhysicistU</td><td>0.25</td><td>40 h</td><td>0 w</td><td>7/7/04</td><td>8/3/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>40 h</td></tr><tr><td>43</td><td>StudentU</td><td>1</td><td>160 h</td><td>0 w</td><td>7/7/04</td><td>8/3/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>160 h</td></tr><tr><td>51</td><td>InKind</td><td>1,600</td><td>1,600</td><td>0 w</td><td>7/7/04</td><td>8/3/04</td><td>\$1,600</td><td>\$0</td><td>\$0</td><td>\$1,600</td><td></td><td>0</td><td>0</td><td>1,600</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 18 | PhysicistU | 0.25 | 40 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | 43 | StudentU | 1 | 160 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | 51 | InKind | 1,600 | 1,600 | 0 w | 7/7/04 | 8/3/04 | \$1,600 | \$0 | \$0 | \$1,600 | | 0 | 0 | 1,600 | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.25 | 40 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | StudentU | 1 | 160 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 1,600 | 1,600 | 0 w | 7/7/04 | 8/3/04 | \$1,600 | \$0 | \$0 | \$1,600 | | 0 | 0 | 1,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Design of testing for stuffed hybrids and run through with equipment M&S BOE- Costs for university student at \$10 per hour x 160 hours = \$1600 Labor BOE- A student will work for 4 weeks to verify the operation of the test stands with sample parts and the existing software developed elsewhere. A physicist will oversee the effort at 25% (40 hours). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.3.10.2 | Develop hybrid burn-in test (KU) | 8/4/04 | 8/31/04 | \$0 | \$400 | \$0 | \$400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>43</td><td>StudentU</td><td>0.25</td><td>40 h</td><td>0 w</td><td>8/4/04</td><td>8/31/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>40 h</td></tr><tr><td>51</td><td>InKind</td><td>400</td><td>400</td><td>0 w</td><td>8/4/04</td><td>8/31/04</td><td>\$400</td><td>\$0</td><td>\$0</td><td>\$400</td><td></td><td>0</td><td>0</td><td>400</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 43 | StudentU | 0.25 | 40 h | 0 w | 8/4/04 | 8/31/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | 51 | InKind | 400 | 400 | 0 w | 8/4/04 | 8/31/04 | \$400 | \$0 | \$0 | \$400 | | 0 | 0 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | StudentU | 0.25 | 40 h | 0 w | 8/4/04 | 8/31/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 400 | 400 | 0 w | 8/4/04 | 8/31/04 | \$400 | \$0 | \$0 | \$400 | | 0 | 0 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Designing and testing of the burn-in stands that will power cycle and readout hybrids continuously for a few day period, including analysis software. (non-FNAL part) M&S BOE- One week (40 hrs) of university student tech labor spread over 4 weeks at \$10 per hour = \$400. Labor BOE- Burn-in stands are verified for use with L0 hybrids. The task is done in conjunction with a fermilab technician (see next task for Fermilab effort). Verifies the power consumption and setups while a student runs some sample tests. The student verifies all of the software works for hybrid testing. Assumed to take 4 weeks, building on work from run 2b. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | |
|--------------|--|---------------|-------|-------|---------|---------|---------|-----------|---------------|------------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.3.10.3 | Develop hybrid burn-in test (FNAL) | | | | 8/4/04 | 8/31/04 | \$0 | \$0 | \$3,120 | \$3,120 | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 13 | ElecTechF | 0.5 | 80 h | 0 w | 8/4/04 | 8/31/04 | \$3,120 | \$0 | \$0 | \$3,120 | 0 h | 0 h | 0 h | 80 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Designing and testing of the burn-in stands that will power cycle and readout hybrids continuously for a few day period, including analysis software. (FNAL part.) | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |
| | Labor BOE- Burn-in stands are verified for use with L0 hybrids. The task is done in conjunction with a university student (see previous task for university effort). Technician verifies the power consumption and setups while a student runs some sample tests. The student verifies all of the software works for hybrid testing. Assumed to take 50% of a Fermilab technician for 4 weeks (80 hrs), building on work from run 2b. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.3.10.4 | Wipe hybrids | | | | 7/7/04 | 7/20/04 | \$0 | \$0 | \$280 | \$280 | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 8 | MechTechF | 0.1 | 8 h | 0 w | 7/7/04 | 7/20/04 | \$280 | \$0 | \$0 | \$280 | 0 h | 0 h | 0 h | 8 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- After receipt, hybrids must be wiped and checked for Be contamination. | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |
| | Labor BOE- 1 day of tech time to assist ESH personnel with wipes and followup. Two week task duration for turnaround of samples and receipt of report. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.3.10.5 | Measure hybrids (mechanical) | | | | 7/21/04 | 8/10/04 | \$0 | \$600 | \$0 | \$600 | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 12 h | 0 w | 7/21/04 | 8/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| | 37 | OGP | 0.5 | 60 h | 0 w | 7/21/04 | 8/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| | 43 | StudentU | 0.5 | 60 h | 0 w | 7/21/04 | 8/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| | 51 | InKind | 600 | 600 | 0 w | 7/21/04 | 8/10/04 | \$600 | \$0 | \$0 | \$600 | | 0 | 0 | 600 |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Perform dimensional checks and inspections for damage (Kansas University effort). | | | | | | | | | | | | | | |
| | M&S BOE- 60 hours (50%) of a student/ technician spread over 3 weeks. Assume \$10 per hr *60 hrs=\$600 (KU student/tech). 10% of a physicist to oversee the effort. ----- Total=\$ 600 | | | | | | | | | | | | | | |
| | Also use of an OGP for the inspections and measurements. | | | | | | | | | | | | | | |
| | Labor BOE- See M&S BOE | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.3.10.6 | Probe bare hybrids | | | | 7/21/04 | 8/31/04 | \$0 | \$6,000 | \$0 | \$6,000 | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 47 | Student | 1 | 240 h | 0 w | 7/21/04 | 8/31/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 240 h |
| | 51 | InKind | 6,000 | 6,000 | 0 w | 7/21/04 | 8/31/04 | \$6,000 | \$0 | \$0 | \$6,000 | | 0 | 0 | 6,000 |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Testing of bare hybrids at Cal State-Fresno, including a visual inspection and verification by probing of the electrical continuity of the hybrid, and production of all needed documentation. | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Probe bare hybrids" continued

Notes

M&S BOE-
There are a total of 96 hybrids (48 + 48 spares).
Visual inspection on each hybrid at 0.5 hours per hybrid *96 = 48 hours
All hybrids will be probed using automatic prober which takes 2 hours per hybrid*96=192 hours.

total hrs= 240 hrs

\$25 per hour x 240 hrs =\$6000 (student, including fresno overhead)

Total=\$6000

Labor BOE
see above M&S BOE

| | | | | | | | |
|--------------|----------------------------|--------|----------|---------|-----|-----|---------|
| 1.6.2.3.10.7 | Stuff and wirebond hybrids | 9/1/04 | 10/27/04 | \$6,760 | \$0 | \$0 | \$6,760 |
|--------------|----------------------------|--------|----------|---------|-----|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|--------|----------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.2 | 64 h | 0 w | 9/1/04 | 10/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 64 h |
| 51 | InKind | 6,760 | 6,760 | 0 w | 9/1/04 | 10/27/04 | \$6,760 | \$0 | \$0 | \$6,760 | | 0 | 0 | 6,760 |

Notes

WBS Definition-
Components, including SVX4, are placed and attached at a vendor, and then all wirebonding is done.

M&S BOE-
Total number of hybrids is 96 (48 + 48 spares). Cost to stuff, wirebond, and test at vendor is assumed to be \$60/hybridx96 hybrids = \$5760. \$1000 for travel to vendor.

Total=\$6760

Labor BOE-
Run2a experience of communication and followup with vendors, a total of 20% of Physicist is assigned during the production run. The time for this process is assume to take 8 weeks.

| | | | | | | | |
|--------------|------------------------------------|----------|----------|-------|---------|-----|---------|
| 1.6.2.3.10.8 | Perform initial functionality test | 10/28/04 | 11/24/04 | \$300 | \$3,800 | \$0 | \$4,100 |
|--------------|------------------------------------|----------|----------|-------|---------|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-----------------|-------|-------|-------|----------|----------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 35 | SASEQTestStandU | 1 | 160 h | 0 w | 10/28/04 | 11/24/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 47 | Student | 0.95 | 152 h | 0 w | 10/28/04 | 11/24/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 152 h |
| 51 | InKind | 4,100 | 4,100 | 0 w | 10/28/04 | 11/24/04 | \$4,100 | \$0 | \$0 | \$4,100 | | 0 | 0 | 4,100 |

Notes

WBS Definition-
Tests of basic readout and noise functions done at CalState-Fresno This test uses the stand-alone test stand.

M&S BOE-
Each hybrid is assumed to take 1 hour to test for a total of 96 hours (by student). In addition, ~15% of the hybrids are assumed to take an extra 4 hours to debug and fix for a total of 56 hours (by student).
(96hrs + 56 hrs)x\$25/hr= \$3800 . Include \$300 for shipping.

Total= \$4100

A test stand is assumed to be dedicated full time to the functional testing.

Labor BOE-
Basically a full time student at a university for 4 weeks of testing, using a test stand. Run 2a/b experience.

| | | | | | | | |
|--------------|------------------------------|----------|---------|---------|-----|-----|---------|
| 1.6.2.3.10.9 | Perform hybrid burn-in tests | 11/11/04 | 1/19/05 | \$1,000 | \$0 | \$0 | \$1,000 |
|--------------|------------------------------|----------|---------|---------|-----|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-------------------|-------|-------|-------|----------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.1 | 32 h | 0 w | 11/11/04 | 1/19/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h |
| 39 | HybridBurnInStand | 1 | 320 h | 0 w | 11/11/04 | 1/19/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 47 | Student | 0.5 | 160 h | 0 w | 11/11/04 | 1/19/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 51 | InKind | 1,000 | 1,000 | 0 w | 11/11/04 | 1/19/05 | \$1,000 | \$0 | \$0 | \$1,000 | | 0 | 0 | 1,000 |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | |
|---|--|---------|---------|-----------|-----------|------------|------------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| "Perform hybrid burn-in tests" continued | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Power cycling and reading out L0 hybrids for a few days and analyzing noise and other performance characteristics of hybrids M&S BOE- \$1000 - supplies, shipping, repair Labor BOE- Assume that 96 hybrids need to be burned in and that some (~15%) need to be burned in twice, so assume there are a total of 110 burn-in cycles that happen over 8 weeks. Thus 14 hybrids need to be burned-in per week, which is within the available capacity of a single test stand. Each burn-in takes 3 days. The total labor needed assumes 1 hour of physicist shifter (probably students) per hybrid burned-in =1*110= 110 hours, plus a day each for initial system set up and closedown (16 hours) = 126 hrs total. A technician is also needed to help with maintenance of the stand and perform repairs on the hybrids. Assume that ~15% of the 96 hybrids which are needed require some sort of repair (as assumed above to get a total of ~110 burn-in cycles). If each repair takes ~3 hours then a total time of ~42 hrs is spent on repairs. Allow an additional 5 days spent over the 8 week duration for system maintenance for a total of 82 hrs (~2 weeks spent. A physicist also will be overseeing the operation to make sure it is running smoothly. This can be a postdoctoral researcher at 5% of their time for the duration. | | | | | | | | | | | | | | |
| 1.6.2.3.11 | All L0 Hybrids Delivered, Stuffed, and Tested | 1/19/05 | 1/19/05 | \$0 | \$0 | \$0 | \$0 | | | | | | | |
| <u>Notes</u> WBS Definition- Milestone: All hybrids have been delivered, stuffed, tested and are ready for assembly onto modules. | | | | | | | | | | | | | | |
| 1.6.2.4 | Analog Cables | 11/3/03 | 9/29/04 | \$105,400 | \$800 | \$10,264 | \$116,464 | | | | | | | |
| <u>Notes</u> WBS Definition- Summary task that includes design, production, and testing of L0 analog flex cables. | | | | | | | | | | | | | | |
| 1.6.2.4.1 | Design analog cables and spacers | 11/3/03 | 2/6/04 | \$0 | \$0 | \$8,304 | \$8,304 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 0.1 | 48 h | 0 w | 11/3/03 | 2/6/04 | \$2,448 | \$0 | \$0 | \$2,448 | 0 h | 0 h | 0 h | 48 h |
| 13 | ElecTechF | 0.2 | 96 h | 0 w | 11/3/03 | 2/6/04 | \$3,744 | \$0 | \$0 | \$3,744 | 0 h | 0 h | 0 h | 96 h |
| 18 | PhysicistU | 0.5 | 240 h | 0 w | 11/3/03 | 2/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 240 h |
| 21 | DesignerF | 0.1 | 48 h | 0 w | 11/3/03 | 2/6/04 | \$2,112 | \$0 | \$0 | \$2,112 | 0 h | 0 h | 0 h | 48 h |
| <u>Notes</u> WBS Definition- Design and layout for analog flex cables and spacers for L0. Analog cable connects L0 sensor and L0 hybrid. Two cables are required for one L0 module, one laid on top of the other, with traces offset by one-half the cable pitch. Cable specs are provided. M&S BOE n/a Labor BOE- 12 weeks of 50% Physicist, 20% ElecTechF, 10% MechEngF and 10% DesignerF are based on the accomplished prototype layout. ElecTechF to work on layout of two types of cables and the layout of the HV filtering board. MechEngF needed to understand constraints of L0 support structure. DesignerF needed to produce 3 drawings of the cable. | | | | | | | | | | | | | | |
| 1.6.2.4.2 | Conduct analog cable production readiness review | 2/9/04 | 2/13/04 | \$0 | \$0 | \$1,960 | \$1,960 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 0.3 | 12 h | 0 w | 2/9/04 | 2/13/04 | \$612 | \$0 | \$0 | \$612 | 0 h | 0 h | 0 h | 12 h |
| 13 | ElecTechF | 0.3 | 12 h | 0 w | 2/9/04 | 2/13/04 | \$468 | \$0 | \$0 | \$468 | 0 h | 0 h | 0 h | 12 h |
| 17 | PhysicistF | 0.3 | 12 h | 0 w | 2/9/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| 18 | PhysicistU | 0.2 | 8 h | 0 w | 2/9/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 21 | DesignerF | 0.5 | 20 h | 0 w | 2/9/04 | 2/13/04 | \$880 | \$0 | \$0 | \$880 | 0 h | 0 h | 0 h | 20 h |
| <u>Notes</u> WBS Definition- Review final design for acceptability, make any necessary changes in final design/specs, and prepare documentation. Labor BOE- Requires participation of mechanical engineer, designer, technician, and physicists to review final design and assembly issues. Assume a day for the review itself for all parties, another day and a half for a | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | |
|---|--------------------------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|---------|
| "Conduct analog cable production readiness review" continued | | | | | | | | | | | | | | | |
| <u>Notes</u> designer to make any final changes, a half-day for an engineer, technician, and Fermilab physicist to review and approve them, and document the results of the review. | | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | | |
| 1.6.2.4.3 | Bid analog cable production | 2/16/04 | 2/27/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | |
| <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> | |
| 18 | PhysicistU | 0.2 | 16 h | 0 w | 2/16/04 | 2/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | |
| <u>Notes</u> WBS Definition- Solicit bids from cable vendors via procurement office. | | | | | | | | | | | | | | | |
| Labor BOE- A couple of days spread over two weeks for a physicist to arrange for solicitation of bids, respond to vendor questions, and consider the bids received. | | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | | |
| 1.6.2.4.4 | Prepare analog cable req and PO | 3/1/04 | 3/26/04 | \$0 | \$800 | \$0 | \$800 | | | | | | | | |
| <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> | |
| 15 | ElecTechU | 0.1 | 16 h | 0 w | 3/1/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | |
| 18 | PhysicistU | 0.2 | 32 h | 0 w | 3/1/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | |
| 51 | InKind | 800 | 800 | 0 w | 3/1/04 | 3/26/04 | \$800 | \$0 | \$0 | \$800 | | 0 | 0 | 800 | |
| <u>Notes</u> WBS Definition- Prepare and submit the purchase requisition once bids are received, and then follow-up through the procurement process to the point where the purchase order is placed with the selected vendor. | | | | | | | | | | | | | | | |
| Labor BOE- Four days of physicist labor to prepare the req and two days of an electrical tech to follow-up over the assumed 4 weeks it takes to get the P.O. placed with the vendor. | | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | | |
| 1.6.2.4.5 | Release Analog Cables for Production | 3/26/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | |
| <u>Notes</u> WBS Definition- Milestone: Design and specifications have been verified and the PO has been placed with the selected vendor so that the production run of analog cables can be started. | | | | | | | | | | | | | | | |
| 1.6.2.4.6 | Produce analog cables | 3/29/04 | 7/20/04 | \$103,400 | \$0 | \$0 | \$103,400 | | | | | | | | |
| <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> | |
| 18 | PhysicistU | 0.05 | 32 h | 0 w | 3/29/04 | 7/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h | |
| 51 | InKind | 103,400 | 103,400 | 0 w | 3/29/04 | 7/20/04 | \$103,400 | \$0 | \$0 | \$103,400 | | | 0 | 0 | 103,400 |
| <u>Notes</u> WBS Definition- Vendor production of analog cables. | | | | | | | | | | | | | | | |
| Labor BOE- None | | | | | | | | | | | | | | | |
| M&S BOE- 96 cables + 96 spares at \$400 per cable and \$50 per spacer = \$86,400 NRE = \$17,000 ----- Total=\$103,400 | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | | Finish | | M&S EQ | | M&S Labor | | FNAL Labor | | Total Cost | | | |
|-----------|--|---------------|-------|---------|-------|----------|---------|-----------|---------------|------------|-----------|------------|---------------|-----------|-----------|
| 1.6.2.4.7 | Test analog cables | 7/21/04 | | 9/29/04 | | \$2,000 | | \$0 | | \$0 | | \$2,000 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 40 h | 0 w | 7/21/04 | 9/29/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| | 47 | Student | 1 | 400 h | 0 w | 7/21/04 | 9/29/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 400 h |
| | 51 | InKind | 2,000 | 2,000 | 0 w | 7/21/04 | 9/29/04 | \$2,000 | \$0 | \$0 | \$2,000 | | 0 | 0 | 2,000 |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Testing of production analog cables. | | | | | | | | | | | | | | |
| | Labor BOE- Full time student for 10 weeks to test 192 cables (resistance and capacitance) | | | | | | | | | | | | | | |
| | M&S BOE- test fixturing - \$1500 shipping- \$500 ----- Total= \$2,000 | | | | | | | | | | | | | | |
| 1.6.2.4.8 | All Analog Cables Delivered and Tested | 9/29/04 | | 9/29/04 | | \$0 | | \$0 | | \$0 | | \$0 | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Milestone: Production and testing of all L0 analog cables is complete. | | | | | | | | | | | | | | |
| 1.6.2.5 | Flex Grounding Circuits | 2/2/04 | | 4/16/04 | | \$15,580 | | \$0 | | \$6,160 | | \$21,740 | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Summary task covering the production and testing of flexible grounding circuits. | | | | | | | | | | | | | | |
| 1.6.2.5.1 | Design grounding circuits | 2/2/04 | | 2/27/04 | | \$0 | | \$0 | | \$4,400 | | \$4,400 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 4 | ElecEngF | 0.5 | 80 h | 0 w | 2/2/04 | 2/27/04 | \$4,400 | \$0 | \$0 | \$4,400 | 0 h | 0 h | 0 h | 80 h |
| | 17 | PhysicistF | 0.1 | 16 h | 0 w | 2/2/04 | 2/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Prepare the final design of flexible grounding circuits for the detector. | | | | | | | | | | | | | | |
| | Labor BOE- 50% of an Fermilab electrical engineer's time spread over 4 weeks to prepare the final design specifications and drawings; two days of physicist time for review and consulting with the engineer. | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.2.5.2 | Bid grounding circuits | 3/1/04 | | 3/12/04 | | \$0 | | \$0 | | \$440 | | \$440 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 4 | ElecEngF | 0.1 | 8 h | 0 w | 3/1/04 | 3/12/04 | \$440 | \$0 | \$0 | \$440 | 0 h | 0 h | 0 h | 8 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- Prepare the specs documentation needed to solicit bids, identify possible vendors, and work with procurement to solicit the bids. | | | | | | | | | | | | | | |
| | Labor BOE- A day of a Fermilab electrical engineer's time to do the above, and review the resutling bids to select the final vendor. | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----------|---|---------|---------|----------|-----------|------------|------------|
| 1.6.2.5.3 | Procure grounding circuits | 3/15/04 | 4/9/04 | \$15,580 | \$0 | \$0 | \$15,580 |
| | <i>ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost Ovt. Work Baseline Work Act. Work Rem. Work</i> | | | | | | |
| | 51 InKind 15,580 15,580 0 w 3/15/04 4/9/04 \$15,580 \$0 \$0 \$15,580 0 0 0 15,580 | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | Prepare and submit the purchase requisition and subsequent PO to the vendor, followed by production of the circuits by the vendor. | | | | | | |
| | Labor BOE- | | | | | | |
| | n/a | | | | | | |
| | M&S BOE- | | | | | | |
| | \$700 NRE + (48 circuits+48 spares) * \$155 per circuit = \$15,580 | | | | | | |
| 1.6.2.5.4 | Test grounding circuits | 4/12/04 | 4/16/04 | \$0 | \$0 | \$1,320 | \$1,320 |
| | <i>ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost Ovt. Work Baseline Work Act. Work Rem. Work</i> | | | | | | |
| | 12 ElecTechSF 1 40 h 0 w 4/12/04 4/16/04 \$1,320 \$0 \$0 \$1,320 0 h 0 h 0 h 40 h | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | Inspection and testing of delivered grounding circuits. | | | | | | |
| | Labor BOE- | | | | | | |
| | One week of a Fermilab electrical tech's time. | | | | | | |
| | M&S BOE- | | | | | | |
| | n/a | | | | | | |
| 1.6.2.6 | Digital Cables | 1/9/04 | 8/24/04 | \$20,829 | \$9,600 | \$0 | \$30,429 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | Summary task that includes design, production, and testing of Layer 0 digital jumper cables. Prototyping was completed as part of the Run 2b upgrade. | | | | | | |
| 1.6.2.6.1 | Design digital cables | 1/9/04 | 2/6/04 | \$0 | \$6,000 | \$0 | \$6,000 |
| | <i>ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost Ovt. Work Baseline Work Act. Work Rem. Work</i> | | | | | | |
| | 6 ElecEngU 0.75 120 h 0 w 1/9/04 2/6/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 120 h | | | | | | |
| | 18 PhysicistU 0.25 40 h 0 w 1/9/04 2/6/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 40 h | | | | | | |
| | 51 InKind 6,000 6,000 0 w 1/9/04 2/6/04 \$6,000 \$0 \$0 \$6,000 0 0 0 6,000 | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | Design and layout of the digital jumper cables needed for Layer 0. These are the cables that attach from the hybrid to the junction card. | | | | | | |
| | Labor BOE- | | | | | | |
| | \$50/hr x 120 hr =\$6000 of a university electrical engineer (75%) and 25% of a university physicist to consult with the engineer as the design is finalized. | | | | | | |
| | M&S BOE- | | | | | | |
| | n/a | | | | | | |
| 1.6.2.6.2 | Conduct digital cable production readiness review | 2/9/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 |
| | <i>ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost Ovt. Work Baseline Work Act. Work Rem. Work</i> | | | | | | |
| | 18 PhysicistU 0.5 20 h 0 w 2/9/04 2/13/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 20 h | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | Review of final design and layout of digital jumper cable to verify mechanical and electrical specifications. | | | | | | |
| | Labor BOE- | | | | | | |
| | A university physicist spends a half-week (spread over 1 week) in contact with Run2b group and verifies the final specifications and drawings for the digital cables. | | | | | | |
| | M&S BOE- | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|---|--|---------|---------|----------|-----------|------------|------------|
| "Conduct digital cable production readiness review" continued | | | | | | | |
| | <u>Notes</u> n/a | | | | | | |
| 1.6.2.6.3 | Bid digital cable production | 2/16/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 18 PhysicistU 0.1 16 h 0 w 2/16/04 3/12/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 16 h | | | | | | |
| | <u>Notes</u> WBS Definition- Vendor selection and bidding for procurement of cables M&S BOE- n/a Labor BOE- There are 2 days of physicist time allotted for preparation of bid paperwork and vendor followup during the assumed 4 week bid period. | | | | | | |
| 1.6.2.6.4 | Prepare digital cable req and PO | 3/15/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 18 PhysicistU 0.05 8 h 0 w 3/15/04 4/9/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 8 h | | | | | | |
| | <u>Notes</u> WBS Definition- Prepare and submit the digital jumper cable purchase requisition and interact with the buyer to insure a timely preparation and submittal of the purchase order to the selected vendor. Labor BOE- One day of physicist time is allocated to prepare and submit the req and followup with the procurement office. M&S BOE- n/a | | | | | | |
| 1.6.2.6.5 | Release Digital Cables for Production | 4/9/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 |
| | <u>Notes</u> WBS Definition- Milestone: Digital jumper cable design and layout is verified, PO has been prepared and submitted to the vendor. | | | | | | |
| 1.6.2.6.6 | Produce digital cables | 4/12/04 | 7/6/04 | \$13,569 | \$0 | \$0 | \$13,569 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 18 PhysicistU 0.1 48 h 0 w 4/12/04 7/6/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 48 h | | | | | | |
| | 51 InKind 13,569 13,569 0 w 4/12/04 7/6/04 \$13,569 \$0 \$0 \$13,569 0 0 0 13,569 | | | | | | |
| | <u>Notes</u> WBS Definition- Vendor production of digital cables. Labor BOE- 10% of a physicist time is assumed over the 12 week production period to followup with the vendor M&S BOE- Material cost = \$5905 Flex Fabrication: 4 x \$400=\$1600 96x\$30ea= \$2880 Ablation: \$400 +4x\$300=\$1600 (setup) 96x\$16.50=\$1584 (production) ----- Total= \$13,569 | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | | Finish | | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | |
|-----------|--|---------------|-------|----------|-------|----------|-----------|------------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.6.7 | Terminate digital cables | 7/7/04 | | 7/27/04 | | \$6,260 | \$3,600 | \$0 | \$9,860 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 15 | ElecTechU | 1 | 120 h | 0 w | 7/7/04 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| | 51 | InKind | 9,860 | 9,860 | 0 w | 7/7/04 | 7/27/04 | \$9,860 | \$0 | \$0 | \$9,860 | | 0 | 0 | 9,860 |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Place connectors on the ends of bare digital cables. | | | | | | | | | | | | | | |
| | Labor BOE- Three weeks of universtiy electrical technican time- \$30/hr x 120 hrs=\$3600 | | | | | | | | | | | | | | |
| | M&S BOE- (\$2430+\$200)x2=\$5260 two reels of Molex connectors with pins removed near HV \$1000 - fixturing | | | | | | | | | | | | | | |
| | Total=\$6260 | | | | | | | | | | | | | | |
| 1.6.2.6.8 | Test digital cables | 7/28/04 | | 8/24/04 | | \$1,000 | \$0 | \$0 | \$1,000 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 16 h | 0 w | 7/28/04 | 8/24/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 47 | Student | 0.5 | 80 h | 0 w | 7/28/04 | 8/24/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| | 51 | InKind | 1,000 | 1,000 | 0 w | 7/28/04 | 8/24/04 | \$1,000 | \$0 | \$0 | \$1,000 | | 0 | 0 | 1,000 |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Testing of production digital cables | | | | | | | | | | | | | | |
| | Labor BOE- 1 hr per cable x 96 cables = 96 hours = ~ 4 weeks of a student at 50% plus 10% of a physicist to oversee the effort. | | | | | | | | | | | | | | |
| | M&S BOE- student rate \$0 per hour test fixturing = \$1000 | | | | | | | | | | | | | | |
| | Total= \$1,000 | | | | | | | | | | | | | | |
| 1.6.2.6.9 | All Digital Cables Delivered and Tested | 8/24/04 | | 8/24/04 | | \$0 | \$0 | \$0 | \$0 | | | | | | |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Milestone: All Layer 0 digital cables have been produced, delivered, and tested. | | | | | | | | | | | | | | |
| 1.6.2.7 | Twisted-Pair Cables | 1/9/04 | | 10/13/04 | | \$24,373 | \$2,880 | \$10,232 | \$37,485 | | | | | | |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- This summary task that describes the design, layout, procurement, and testing of the twisted-pair cables and also includes the connection of the twisted pair cables to the junction cards. | | | | | | | | | | | | | | |
| 1.6.2.7.1 | Design twisted-pair cables | 1/9/04 | | 1/23/04 | | \$0 | \$0 | \$6,096 | \$6,096 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 1 | MechEngF | 0.2 | 16 h | 0 w | 1/9/04 | 1/23/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h |
| | 4 | ElecEngF | 0.4 | 32 h | 0 w | 1/9/04 | 1/23/04 | \$1,760 | \$0 | \$0 | \$1,760 | 0 h | 0 h | 0 h | 32 h |
| | 17 | PhysicistF | 0.4 | 32 h | 0 w | 1/9/04 | 1/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h |
| | 21 | DesignerF | 1 | 80 h | 0 w | 1/9/04 | 1/23/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | |
|--|--|----------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|
| "Design twisted-pair cables" continued | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Design and layout of twisted pair cables and connectors. Final design will require input from mechanical group to define cable paths and lengths. M&S BOE n/a Labor BOE- 2 weeks of ElecEngF[40%] and PhysicistF[40%] is required to implement findings from preproduction run to the design of three types of twisted pair cable (signal, power, HV) and other components of the cable. DesignerF[100%] and MechEngF[20%] are needed to define cable paths from junction cards to the Horseshoe. 5 drawings are required to determine cable lengths. | | | | | | | | | | | | | | | |
| 1.6.2.7.2 | Conduct twisted-pair cable production readiness review | 1/26/04 | 1/30/04 | \$0 | \$0 | \$1,640 | \$1,640 | | | | | | | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 1 | MechEngF | 0.2 | 8 h | 0 w | 1/26/04 | 1/30/04 | \$408 | \$0 | \$0 | \$408 | 0 h | 0 h | 0 h | 8 h |
| | 4 | ElecEngF | 0.4 | 16 h | 0 w | 1/26/04 | 1/30/04 | \$880 | \$0 | \$0 | \$880 | 0 h | 0 h | 0 h | 16 h |
| | 17 | PhysicistF | 0.4 | 16 h | 0 w | 1/26/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 21 | DesignerF | 0.2 | 8 h | 0 w | 1/26/04 | 1/30/04 | \$352 | \$0 | \$0 | \$352 | 0 h | 0 h | 0 h | 8 h |
| <u>Notes</u> WBS Definition- Review final design of twisted pair cables prior to procurement Labor BOE- 2 days each of EEF and PhysF time to review and approve the final design; a day of DesF and MEF time to review the design M&S BOE- n/a | | | | | | | | | | | | | | | |
| 1.6.2.7.3 | Bid twisted-pair cable production | 2/2/04 | 2/27/04 | \$0 | \$0 | \$624 | \$624 | | | | | | | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 13 | ElecTechF | 0.1 | 16 h | 0 w | 2/2/04 | 2/27/04 | \$624 | \$0 | \$0 | \$624 | 0 h | 0 h | 0 h | 16 h |
| | 17 | PhysicistF | 0.1 | 16 h | 0 w | 2/2/04 | 2/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| <u>Notes</u> WBS Definition- Vendor selection and bidding for procurement of cables M&S BOE- n/a Labor BOE- Communications with vendors. Run2a experience says you need some physicist time as well as ETF time for followup; we allocate 2 days each spread over 4 weeks. | | | | | | | | | | | | | | | |
| 1.6.2.7.4 | Prepare twisted-pair cable req and PO | 3/1/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 18 | PhysicistU | 0.2 | 32 h | 0 w | 3/1/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h |
| <u>Notes</u> WBS Definition- Prepare the purchase requisition and submit to procurement system; followup through the final purchase order submittal to the vendor Labor BOE- We allocate 4 days of a university physicist time over the assumed 4 week period leading from a req to relaease of the PO. M&S BOE- n/a | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----------|--|---------|---------|--------|-----------|------------|------------|
| 1.6.2.7.5 | Release Twisted-pair Cables for Production | 3/26/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 |

Notes
WBS Definition-
Milestone- The PO is submitted to the selected twisted pair cable vendor(s).

| | | | | | | | |
|-----------|---------------------------------------|---------|---------|---------|-----|---------|---------|
| 1.6.2.7.6 | Procure parts for twisted-pair cables | 3/29/04 | 6/21/04 | \$5,886 | \$0 | \$1,872 | \$7,758 |
|-----------|---------------------------------------|---------|---------|---------|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 13 | ElecTechF | 0.1 | 48 h | 0 w | 3/29/04 | 6/21/04 | \$1,872 | \$0 | \$0 | \$1,872 | 0 h | 0 h | 0 h | 48 h |
| 18 | PhysicistU | 0.1 | 48 h | 0 w | 3/29/04 | 6/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 48 | MandS | 5,886 | 5,886 | 0 w | 3/29/04 | 6/21/04 | \$5,886 | \$0 | \$0 | \$5,886 | | 0 | 0 | 5,886 |

Notes
WBS Definition-
Procurement of twisted-pair and coax cables.

M&S BOE
Assume 96 80" cable assemblies. (48 needed + 48 spares)
Per cable :
signal and power twisted-pair cable 80" x \$8.27/ft = \$55.41
clock minicoaxial cable 80" x \$0.44 x 2 = \$5.90, NE Electric Wire quote 7/20/1999
total per cable assembly : \$61.31

96x\$61.31=\$5886 (for 96 assemblies)

Labor BOE-
ElecTechF[5%] for the full duration of 20 weeks to coordinate procurement.

| | | | | | | | |
|-----------|------------------------------|---------|---------|----------|---------|-----|----------|
| 1.6.2.7.7 | Assemble twisted-pair cables | 6/22/04 | 9/15/04 | \$17,987 | \$2,880 | \$0 | \$20,867 |
|-----------|------------------------------|---------|---------|----------|---------|-----|----------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|--------|--------|-------|---------|---------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 15 | ElecTechU | 0.2 | 96 h | 0 w | 6/22/04 | 9/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 96 h |
| 18 | PhysicistU | 0.1 | 48 h | 0 w | 6/22/04 | 9/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 51 | InKind | 20,867 | 20,867 | 0 w | 6/22/04 | 9/15/04 | \$20,867 | \$0 | \$0 | \$20,867 | | 0 | 0 | 20,867 |

Notes
WBS Definition:
Vendor termination and assembly of 96 twisted-pair and clock cables

M&S BOE
per cable-
\$177.36 twisted-pair signal and power (omnetics)
\$10 (two clock cables per assembly) (omentics)

Total=\$187.36 (per assembly)
96x\$187.36=\$17,987 (for all 96 assemblies)

(note: with bare cable cost included (see previous task) the total vendor per cable assembly cost is: \$187.36 + \$61.31=\$248.67

Labor BOE
PhysicistF[10%] for the duration of the task to coordinate the assembly; 1 hr per cablefor ETU to make assembly for power, signal, and coax.

| | | | | | | | |
|-----------|--------------------------|---------|----------|-------|-----|-----|-------|
| 1.6.2.7.8 | Test twisted-pair cables | 9/16/04 | 10/13/04 | \$500 | \$0 | \$0 | \$500 |
|-----------|--------------------------|---------|----------|-------|-----|-----|-------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|---------|----------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.1 | 16 h | 0 w | 9/16/04 | 10/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| 47 | Student | 0.25 | 40 h | 0 w | 9/16/04 | 10/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 500 | 500 | 0 w | 9/16/04 | 10/13/04 | \$500 | \$0 | \$0 | \$500 | | 0 | 0 | 500 |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------|---------------|----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|---|----------|------|------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|------------|------|------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|------------|------|------|-----|----------|---------|-------|-----|-----|-------|-----|-----|-----|------|----|--------|-------|-------|-----|----------|---------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| "Test twisted-pair cables" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Twisted pair-cable assemblies are tested to ensure they meet mechanical and electrical specifications. This includes functional testing with a junction card attached. Labor BOE- A week of student time spread over 4 weeks, and 2 days of university physicist time to oversee the student's work. M&S BOE- \$300 fixturing \$200 shipping ----- Total: \$500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.7.9 | All Twisted-pair Cables Assembled and Tested | 10/13/04 | 10/13/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Milestone: All cables tested and ready for final assembly onto junction cards. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.8 | Junction Cards | 12/17/03 | 7/20/04 | \$14,400 | \$9,880 | \$0 | \$24,280 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- This summary task describes the design, prototyping, production, and testing of the L0 junction cards which are fit at the end of the active region. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.8.1 | Design junction cards | 12/17/03 | 3/19/04 | \$0 | \$6,400 | \$0 | \$6,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>6</td><td>ElecEngU</td><td>0.17</td><td>80 h</td><td>0 w</td><td>12/17/03</td><td>3/19/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr><tr><td>15</td><td>ElecTechU</td><td>0.17</td><td>80 h</td><td>0 w</td><td>12/17/03</td><td>3/19/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.08</td><td>40 h</td><td>0 w</td><td>12/17/03</td><td>3/19/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>40 h</td></tr><tr><td>51</td><td>InKind</td><td>6,400</td><td>6,400</td><td>0 w</td><td>12/17/03</td><td>3/19/04</td><td>\$6,400</td><td>\$0</td><td>\$0</td><td>\$6,400</td><td></td><td>0</td><td>0</td><td>6,400</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 6 | ElecEngU | 0.17 | 80 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | 15 | ElecTechU | 0.17 | 80 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | 18 | PhysicistU | 0.08 | 40 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | 51 | InKind | 6,400 | 6,400 | 0 w | 12/17/03 | 3/19/04 | \$6,400 | \$0 | \$0 | \$6,400 | | 0 | 0 | 6,400 | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ElecEngU | 0.17 | 80 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | ElecTechU | 0.17 | 80 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.08 | 40 h | 0 w | 12/17/03 | 3/19/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 6,400 | 6,400 | 0 w | 12/17/03 | 3/19/04 | \$6,400 | \$0 | \$0 | \$6,400 | | 0 | 0 | 6,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Design and layout of junction cards for Layer 0. These cards have a connection for the digital jumper cable coming from the hybrid and then will have the twisted pair cables soldered on. The Layer 0 junction cards attach 2 hybrids per card and the card itself is 8 layers to route signals. Only passive components are included on the cards. Labor BOE- \$60/hrx80 hrs=\$4800 (EEU) \$20/hrx80 hrs=\$1600 (ETU) ----- Total=\$6400 M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.8.2 | Conduct junction card production readiness review | 3/22/04 | 3/26/04 | \$0 | \$600 | \$0 | \$600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>6</td><td>ElecEngU</td><td>0.25</td><td>10 h</td><td>0 w</td><td>3/22/04</td><td>3/26/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>10 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.25</td><td>10 h</td><td>0 w</td><td>3/22/04</td><td>3/26/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>10 h</td></tr><tr><td>51</td><td>InKind</td><td>600</td><td>600</td><td>0 w</td><td>3/22/04</td><td>3/26/04</td><td>\$600</td><td>\$0</td><td>\$0</td><td>\$600</td><td></td><td>0</td><td>0</td><td>600</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 6 | ElecEngU | 0.25 | 10 h | 0 w | 3/22/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h | 18 | PhysicistU | 0.25 | 10 h | 0 w | 3/22/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h | 51 | InKind | 600 | 600 | 0 w | 3/22/04 | 3/26/04 | \$600 | \$0 | \$0 | \$600 | | 0 | 0 | 600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ElecEngU | 0.25 | 10 h | 0 w | 3/22/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.25 | 10 h | 0 w | 3/22/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 600 | 600 | 0 w | 3/22/04 | 3/26/04 | \$600 | \$0 | \$0 | \$600 | | 0 | 0 | 600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Review and approval of final junction card design. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | |
|---|---------------------------------------|---------------|--------|--------|-------|---------|---------|----------|---------------|-----------|------------|------------|---------------|-----------|-----------|
| "Conduct junction card production readiness review" continued | | | | | | | | | | | | | | | |
| <div>Notes</div> <div>Labor BOE- \$60/hrx10hrs=\$600 (EEU)</div> <div>M&S BOE- n/a</div> | | | | | | | | | | | | | | | |
| 1.6.2.8.3 | Prepare junction card req and PO | | | | | | 3/29/04 | 4/23/04 | \$0 | \$960 | \$0 | \$960 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 6 | ElecEngU | 0.1 | 16 h | 0 w | 3/29/04 | 4/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 18 | PhysicistU | 0.1 | 16 h | 0 w | 3/29/04 | 4/23/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 51 | InKind | 960 | 960 | 0 w | 3/29/04 | 4/23/04 | \$960 | \$0 | \$0 | \$960 | | 0 | 0 | 960 |
| <div>Notes</div> <div>WBS Definition- Prepare and submit junction card purchase requisition and subsequent purchase order to be submitted to vendor.</div> <div>Labor BOE- \$60/hrx16hrs=\$960 (EEU)</div> <div>M&S BOE- n/a</div> | | | | | | | | | | | | | | | |
| 1.6.2.8.4 | Release Junction Cards for Production | | | | | | 4/23/04 | 4/23/04 | \$0 | \$0 | \$0 | \$0 | | | |
| <div>Notes</div> <div>WBS Definition- Milestone: The junction card purchase order has been submitted to the vendor.</div> | | | | | | | | | | | | | | | |
| 1.6.2.8.5 | Produce junction cards | | | | | | 4/26/04 | 6/21/04 | \$14,400 | \$0 | \$0 | \$14,400 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.05 | 16 h | 0 w | 4/26/04 | 6/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 51 | InKind | 14,400 | 14,400 | 0 w | 4/26/04 | 6/21/04 | \$14,400 | \$0 | \$0 | \$14,400 | | 0 | 0 | 14,400 |
| <div>Notes</div> <div>WBS Definition- Vendor production and stuffing of junction cards.</div> <div>Labor BOE- n/a</div> <div>M&S BOE- Assume vendor stuffing cost of \$300 per card, i.e. 24 cards + 24 spares at \$300 per card = \$14,400</div> | | | | | | | | | | | | | | | |
| 1.6.2.8.6 | Test junction cards | | | | | | 6/22/04 | 7/20/04 | \$0 | \$1,920 | \$0 | \$1,920 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 6 | ElecEngU | 0.1 | 16 h | 0 w | 6/22/04 | 7/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 15 | ElecTechU | 0.3 | 48 h | 0 w | 6/22/04 | 7/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| | 18 | PhysicistU | 0.1 | 16 h | 0 w | 6/22/04 | 7/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| | 51 | InKind | 1,920 | 1,920 | 0 w | 6/22/04 | 7/20/04 | \$1,920 | \$0 | \$0 | \$1,920 | | 0 | 0 | 1,920 |
| <div>Notes</div> <div>WBS Definition- Electrical and mechanical testing of completed junction cards</div> <div>Labor BOE- \$20/hr0x48 hrs=\$960 (ETU)</div> | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|---|---------|---------|----------|-----------|------------|------------|---------------|---------------|-----------|-----------|---------------|-----------|-----------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|----|-----------|------|-------|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|-------|----|-----------|-------|-------|-----|---------|---------|---------|-----|-----|---------|-----|-----|-----|-------|----|------------|------|-------|-----|---------|--------|-----|-----|-----|-----|-----|-----|-----|-------|----|--------|--------|--------|-----|---------|--------|----------|-----|-----|----------|--|---|---|--------|
| "Test junction cards" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>\$60/hrx16hrs=\$960 (EEU)</div> <div>-----</div> <div>total=\$1920</div> <div>M&S BOE-</div> <div>n/a</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.8.7 | All Junction Cards Produced and Tested | 7/20/04 | 7/20/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>WBS Definition-</div> <div>Milestone: All junction cards have been produced, tested, and are ready for installation.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9 | Adapter Cards | 11/3/03 | 2/23/05 | \$46,400 | \$47,520 | \$7,840 | \$101,760 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>WBS Definition-</div> <div>This summary task includes all design, prototyping, production, and testing of adapter cards which regulate the power and pass the signals to the SVX4 chips.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9.1 | Design adapter cards | 11/3/03 | 3/5/04 | \$0 | \$27,520 | \$0 | \$27,520 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>6</td><td>ElecEngU</td><td>0.6</td><td>384 h</td><td>0 w</td><td>11/3/03</td><td>3/5/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>384 h</td></tr><tr><td>15</td><td>ElecTechU</td><td>0.35</td><td>224 h</td><td>0 w</td><td>11/3/03</td><td>3/5/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>224 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.25</td><td>160 h</td><td>0 w</td><td>11/3/03</td><td>3/5/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>160 h</td></tr><tr><td>51</td><td>InKind</td><td>27,520</td><td>27,520</td><td>0 w</td><td>11/3/03</td><td>3/5/04</td><td>\$27,520</td><td>\$0</td><td>\$0</td><td>\$27,520</td><td></td><td>0</td><td>0</td><td>27,520</td></tr></table> <div>Notes</div> <div>WBS Definition-</div> <div>Design and layout of adapter card. The adapter card is a 6 layer card that services 2 hybrids. It provides the voltage regulation and monitoring for the SVX4 chip. Also provides ground isolation. It translates differential signals to TTL and has connectors for HV pass through on Layer 0 hybrids and connectors.</div> <div>Labor BOE-</div> <div>\$60/hrx384hrs=\$23,040 (EEU)</div> <div>\$20/hrx224hrs=\$4,480 (ETU)</div> <div>-----</div> <div>total=\$27,520</div> <div>M&S BOE-</div> | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 6 | ElecEngU | 0.6 | 384 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 384 h | 15 | ElecTechU | 0.35 | 224 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 224 h | 18 | PhysicistU | 0.25 | 160 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | 51 | InKind | 27,520 | 27,520 | 0 w | 11/3/03 | 3/5/04 | \$27,520 | \$0 | \$0 | \$27,520 | | 0 | 0 | 27,520 |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ElecEngU | 0.6 | 384 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 384 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | ElecTechU | 0.35 | 224 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 224 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.25 | 160 h | 0 w | 11/3/03 | 3/5/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 27,520 | 27,520 | 0 w | 11/3/03 | 3/5/04 | \$27,520 | \$0 | \$0 | \$27,520 | | 0 | 0 | 27,520 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9.2 | Procure prototypes | 3/8/04 | 4/30/04 | \$8,000 | \$1,600 | \$0 | \$9,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>15</td><td>ElecTechU</td><td>0.25</td><td>80 h</td><td>0 w</td><td>3/8/04</td><td>4/30/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr><tr><td>51</td><td>InKind</td><td>9,600</td><td>9,600</td><td>0 w</td><td>3/8/04</td><td>4/30/04</td><td>\$9,600</td><td>\$0</td><td>\$0</td><td>\$9,600</td><td></td><td>0</td><td>0</td><td>9,600</td></tr></table> <div>Notes</div> <div>WBS Definition-</div> <div>procure/prepare prototype cards; includes stuffing of cards</div> <div>Labor BOE-</div> <div>n/a</div> <div>M&S BOE-</div> <div>10bdsx \$800 per board=\$8000 (previous version was 624 per board,stuffed)</div> <div>\$20/hrx80hrs=\$1600 (ETU)</div> | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 15 | ElecTechU | 0.25 | 80 h | 0 w | 3/8/04 | 4/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | 51 | InKind | 9,600 | 9,600 | 0 w | 3/8/04 | 4/30/04 | \$9,600 | \$0 | \$0 | \$9,600 | | 0 | 0 | 9,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | ElecTechU | 0.25 | 80 h | 0 w | 3/8/04 | 4/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 9,600 | 9,600 | 0 w | 3/8/04 | 4/30/04 | \$9,600 | \$0 | \$0 | \$9,600 | | 0 | 0 | 9,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|--------------------------------|--------------|-------|--------|--------|-----------|------------|------------|
| "Procure prototypes" continued | | | | | | | |
| | <u>Notes</u> | | | | | | |
| | ----- | | | | | | |
| | Total=\$9600 | | | | | | |

| | | | | | | | |
|-----------|-----------------|--------|---------|-----|---------|-----|---------|
| 1.6.2.9.3 | Test prototypes | 5/3/04 | 5/28/04 | \$0 | \$6,400 | \$0 | \$6,400 |
|-----------|-----------------|--------|---------|-----|---------|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 6 | ElecEngU | 0.5 | 80 h | 0 w | 5/3/04 | 5/28/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 15 | ElecTechU | 0.5 | 80 h | 0 w | 5/3/04 | 5/28/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 18 | PhysicistU | 0.5 | 80 h | 0 w | 5/3/04 | 5/28/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 51 | InKind | 6,400 | 6,400 | 0 w | 5/3/04 | 5/28/04 | \$6,400 | \$0 | \$0 | \$6,400 | | 0 | 0 | 6,400 |

Notes

WBS Definition-

Perform electrical and mechanical tests to verify operation of boards; includes tests with a pulse generator.

Labor BOE-

\$60/hrx80hrs=\$4800 (EEU)

\$20/hrx80hrs=\$1600 (ETU)

Total=\$6400

M&S BOE-

n/a

| | | | | | | | |
|-----------|------------------------------------|---------|---------|-----|---------|-----|---------|
| 1.6.2.9.4 | Develop final specifications (KSU) | 8/18/04 | 9/15/04 | \$0 | \$2,400 | \$0 | \$2,400 |
|-----------|------------------------------------|---------|---------|-----|---------|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 6 | ElecEngU | 0.25 | 40 h | 0 w | 8/18/04 | 9/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 18 | PhysicistU | 0.25 | 40 h | 0 w | 8/18/04 | 9/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 2,400 | 2,400 | 0 w | 8/18/04 | 9/15/04 | \$2,400 | \$0 | \$0 | \$2,400 | | 0 | 0 | 2,400 |

Notes

WBS Definition-

Design and layout of production adapter card. Verification of all electronic and mechanical specifications. (University part of this effort)

Labor BOE-

\$60/hrx40hrs=\$2400 (EEU)

M&S BOE-

n/a

| | | | | | | | |
|-----------|---|---------|---------|-----|-----|---------|---------|
| 1.6.2.9.5 | Develop final specifications (Fermilab) | 8/18/04 | 9/15/04 | \$0 | \$0 | \$7,840 | \$7,840 |
|-----------|---|---------|---------|-----|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.5 | 80 h | 0 w | 8/18/04 | 9/15/04 | \$4,080 | \$0 | \$0 | \$4,080 | 0 h | 0 h | 0 h | 80 h |
| 4 | ElecEngF | 0.25 | 40 h | 0 w | 8/18/04 | 9/15/04 | \$2,200 | \$0 | \$0 | \$2,200 | 0 h | 0 h | 0 h | 40 h |
| 13 | ElecTechF | 0.25 | 40 h | 0 w | 8/18/04 | 9/15/04 | \$1,560 | \$0 | \$0 | \$1,560 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 0.1 | 16 h | 0 w | 8/18/04 | 9/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |

Notes

WBS Definition-

Design and layout of production adapter card. Verification of all electronic and mechanical specifications. (Fermilab part of this effort.)

Labor BOE-

1 week each of EEF and ETF design effort spread over 4 weeks plus 2 weeks of an MEF. 2 days of PhysF time all in collaboration with KSU (see previous task).

M&S BOE-

n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Develop final specifications (Fermilab)" continued

Notes

| | | | | | | | | | | | | | | |
|-----------|--|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.9.6 | Conduct adapter card production readiness review | | | | | | | 9/16/04 | 9/22/04 | \$0 | \$1,600 | \$0 | \$1,600 | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 6 | ElecEngU | 0.5 | 20 h | 0 w | 9/16/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h |
| 15 | ElecTechU | 0.5 | 20 h | 0 w | 9/16/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h |
| 18 | PhysicistU | 0.25 | 10 h | 0 w | 9/16/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h |
| 51 | InKind | 1,600 | 1,600 | 0 w | 9/16/04 | 9/22/04 | \$1,600 | \$0 | \$0 | \$1,600 | | 0 | 0 | 1,600 |

Notes

WBS Definition-

Review and approve final design and specifications prior to submittal of purchase requisition.

Labor BOE-

\$60/hrx20hrs=\$1200 (EEU)

20/hrx20hrs=\$400 (ETU)

Total=\$1600

M&S BOE-

n/a

| | | | | | | | | | | | | | | | |
|-----------|-----------------------------|---------------|-------|------|-------|---------|----------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.9.7 | Bid adapter card production | | | | | | 9/23/04 | 10/13/04 | \$0 | \$0 | \$0 | \$0 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 12 h | 0 w | 9/23/04 | 10/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |

Notes

WBS Definition-

Submit bid package to potential vendors and review bids received

Labor BOE-

n/a

M&S BOE-

n/a

| | | | | | | | | | | | | | | | |
|-----------|---------------------------------|---------------|-------|------|-------|----------|----------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.9.8 | Prepare adapter card req and PO | | | | | | 10/14/04 | 11/10/04 | \$0 | \$0 | \$0 | \$0 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 16 h | 0 w | 10/14/04 | 11/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |

Notes

WBS Definition-

Prepare and submit the purchase requisition to the procurement dept and subsequently prepare the purchase order for submittal to the selected vendor.

Labor BOE-

A couple of days of university physicist time to prepare the req.

M&S BOE-

n/a

| | | | | | | | |
|-----------|--------------------------------------|----------|----------|-----|-----|-----|-----|
| 1.6.2.9.9 | Release Adapter Cards for Production | 11/10/04 | 11/10/04 | \$0 | \$0 | \$0 | \$0 |
|-----------|--------------------------------------|----------|----------|-----|-----|-----|-----|

Notes

WBS Definition-

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------|---------------|----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|------------|------|------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|-----------|--------|--------|-----|----------|---------|----------|-----|-----|----------|-----|-----|-----|--------|----|------------|------|------|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|--------|-------|-------|-----|---------|---------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|
| "Release Adapter Cards for Production" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> Milestone: The adapter card purchase order is submitted to the vendor. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9.10 | Produce adapter cards | 11/11/04 | 1/26/05 | \$38,400 | \$0 | \$0 | \$38,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>18</td><td>PhysicistU</td><td>0.05</td><td>18 h</td><td>0 w</td><td>11/11/04</td><td>1/26/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>18 h</td></tr><tr><td>51</td><td>InKind</td><td>38,400</td><td>38,400</td><td>0 w</td><td>11/11/04</td><td>1/26/05</td><td>\$38,400</td><td>\$0</td><td>\$0</td><td>\$38,400</td><td></td><td>0</td><td>0</td><td>38,400</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 18 | PhysicistU | 0.05 | 18 h | 0 w | 11/11/04 | 1/26/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 18 h | 51 | InKind | 38,400 | 38,400 | 0 w | 11/11/04 | 1/26/05 | \$38,400 | \$0 | \$0 | \$38,400 | | 0 | 0 | 38,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.05 | 18 h | 0 w | 11/11/04 | 1/26/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 18 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 38,400 | 38,400 | 0 w | 11/11/04 | 1/26/05 | \$38,400 | \$0 | \$0 | \$38,400 | | 0 | 0 | 38,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Vendor production and stuffing of adapter cards Labor BOE- 5% of a PhysU to interact with the vendors, as needed. M&S BOE- 24 cards + 24 spares at \$800 per card = \$38,400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9.11 | Test adapter cards | 1/27/05 | 2/23/05 | \$0 | \$8,000 | \$0 | \$8,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>6</td><td>ElecEngU</td><td>0.5</td><td>80 h</td><td>0 w</td><td>1/27/05</td><td>2/23/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr><tr><td>15</td><td>ElecTechU</td><td>1</td><td>160 h</td><td>0 w</td><td>1/27/05</td><td>2/23/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>160 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.25</td><td>40 h</td><td>0 w</td><td>1/27/05</td><td>2/23/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>40 h</td></tr><tr><td>51</td><td>InKind</td><td>8,000</td><td>8,000</td><td>0 w</td><td>1/27/05</td><td>2/23/05</td><td>\$8,000</td><td>\$0</td><td>\$0</td><td>\$8,000</td><td></td><td>0</td><td>0</td><td>8,000</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 6 | ElecEngU | 0.5 | 80 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | 15 | ElecTechU | 1 | 160 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | 18 | PhysicistU | 0.25 | 40 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | 51 | InKind | 8,000 | 8,000 | 0 w | 1/27/05 | 2/23/05 | \$8,000 | \$0 | \$0 | \$8,000 | | 0 | 0 | 8,000 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ElecEngU | 0.5 | 80 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | ElecTechU | 1 | 160 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.25 | 40 h | 0 w | 1/27/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 8,000 | 8,000 | 0 w | 1/27/05 | 2/23/05 | \$8,000 | \$0 | \$0 | \$8,000 | | 0 | 0 | 8,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Perform all electrical and mechanical tests of production adapter cards. Uses SASEQ teststands to verify operation. Labor BOE- \$20/hrx\$160hrs=\$3200 (ETU) 60/hrx80hrs=\$4800 (EEU) ----- Total=\$8000 M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.9.12 | All Adapter Cards Delivered and Tested | 2/23/05 | 2/23/05 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Milestone: All the production adapter cards have been produced, tested, and are ready for installation. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.2.10 | High-Voltage System | 6/1/04 | 11/17/04 | \$5,000 | \$0 | \$14,360 | \$19,360 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Summary task to describe the design, procurement, and testing of the high voltage system for Layer 0. The system may take advantage of existing hardware, or that already procured for the Run 2b upgrade (including the power supplies). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | | Finish | | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | |
|------------|--|---------------|-------|----------|-------|----------|-----------|------------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.2.10.1 | Design HV System | 6/1/04 | | 8/10/04 | | \$0 | \$0 | \$8,800 | \$8,800 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 4 | ElecEngF | 0.4 | 160 h | 0 w | 6/1/04 | 8/10/04 | \$8,800 | \$0 | \$0 | \$8,800 | 0 h | 0 h | 0 h | 160 h |
| | 17 | PhysicistF | 0.4 | 160 h | 0 w | 6/1/04 | 8/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Design of the final HV system for the Layer 0 detector. | | | | | | | | | | | | | | |
| | Labor BOE- A FNAL EEF and physicist to design modifications to system, including fanout boards. | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.2.10.2 | Release HV System for Production | 8/10/04 | | 8/10/04 | | \$0 | \$0 | \$0 | \$0 | | | | | | |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Milestone: PO submitted to vendor(s) for fanout board modifications and other system components, as needed. | | | | | | | | | | | | | | |
| 1.6.2.10.3 | Produce HV System | 8/11/04 | | 10/20/04 | | \$5,000 | \$0 | \$1,560 | \$6,560 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 13 | ElecTechF | 0.1 | 40 h | 0 w | 8/11/04 | 10/20/04 | \$1,560 | \$0 | \$0 | \$1,560 | 0 h | 0 h | 0 h | 40 h |
| | 17 | PhysicistF | 0.05 | 20 h | 0 w | 8/11/04 | 10/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h |
| | 48 | MandS | 5,000 | 5,000 | 0 w | 8/11/04 | 10/20/04 | \$5,000 | \$0 | \$0 | \$5,000 | | 0 | 0 | 5,000 |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Vendor production of HV supplies. | | | | | | | | | | | | | | |
| | Labor BOE- n/a | | | | | | | | | | | | | | |
| | M&S BOE- 24 supplies + 24 spares in hand (part of Run 2b closeout) \$5000 for modifications to fanout boards. | | | | | | | | | | | | | | |
| 1.6.2.10.4 | Test HV System | 10/21/04 | | 11/17/04 | | \$0 | \$0 | \$4,000 | \$4,000 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 4 | ElecEngF | 0.1 | 16 h | 0 w | 10/21/04 | 11/17/04 | \$880 | \$0 | \$0 | \$880 | 0 h | 0 h | 0 h | 16 h |
| | 13 | ElecTechF | 0.5 | 80 h | 0 w | 10/21/04 | 11/17/04 | \$3,120 | \$0 | \$0 | \$3,120 | 0 h | 0 h | 0 h | 80 h |
| | Notes | | | | | | | | | | | | | | |
| | WBS Definition- Install and test power supplies and fanout boards | | | | | | | | | | | | | | |
| | Labor BOE- 80 hrs (50%) of ETF time for installation and testing, spread over 4 weeks, 10% of a EEF to oversee the testing. | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.2.11 | Readout Chain Integration | 11/3/03 | | 6/2/05 | | \$0 | \$0 | \$73,320 | \$73,320 | | | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 4 | ElecEngF | 0.25 | 780 h | 0 w | 11/3/03 | 6/2/05 | \$42,900 | \$0 | \$0 | \$42,900 | 0 h | 0 h | 0 h | 780 h |
| | 13 | ElecTechF | 0.25 | 780 h | 0 w | 11/3/03 | 6/2/05 | \$30,420 | \$0 | \$0 | \$30,420 | 0 h | 0 h | 0 h | 780 h |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|---|------------------------------|-------|-------|-------|---------|---------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| "Readout Chain Integration" continued | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 17 | PhysicistF | 0.25 | 780 h | 0 w | 11/3/03 | 6/2/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 780 h |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Infrastructure design and support, readout mapping development, and on-going system tests of hybrids, modules, etc. | | | | | | | | | | | | | | |
| Labor BOE- A longterm task over the duration of the project that captures FNAL labor effort to develop, assemble, and test the detector readout chain ; Assume 25% each of a fermilab physicist, electrical engineer, and electrical tech dedicated to the effort. | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1.6.2.12 | Full Chain Tests | | | | 11/3/03 | 6/9/05 | \$2,000 | | \$0 | \$25,160 | | | | \$27,160 |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Summary tast that includes the testing done using a single chain and multiple chains with the real D0 DAQ system. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1.6.2.12.1 | Test mixed SVX2/SVX4 readout | | | | 11/3/03 | 4/30/04 | \$0 | | \$0 | \$5,280 | | | | \$5,280 |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 4 | ElecEngF | 0.1 | 96 h | 0 w | 11/3/03 | 4/30/04 | \$5,280 | \$0 | \$0 | \$5,280 | 0 h | 0 h | 0 h | 96 h |
| 17 | PhysicistF | 0.1 | 96 h | 0 w | 11/3/03 | 4/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 96 h |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Layer 0 will use SVX 4 readout. The existing silicon detector uses SVX2. This test stand work will be done to ensure that the two readout chips will work in the same readout system. | | | | | | | | | | | | | | |
| Labor BOE- Assumed to take about 10% each of a physicist and a Fermilab electrical engineer working for about 6 months. | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1.6.2.12.2 | Test adapter card schemes | | | | 5/24/04 | 8/17/04 | \$0 | | \$0 | \$6,600 | | | | \$6,600 |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 4 | ElecEngF | 0.25 | 120 h | 0 w | 5/24/04 | 8/17/04 | \$6,600 | \$0 | \$0 | \$6,600 | 0 h | 0 h | 0 h | 120 h |
| 17 | PhysicistF | 0.25 | 120 h | 0 w | 5/24/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| 18 | PhysicistU | 0.25 | 120 h | 0 w | 5/24/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Various adapter card modifications are being considered. Each will need to be tested for proper functionality before the final scheme is adopted. The task covers the labor needed to conduct and analyze these tests. | | | | | | | | | | | | | | |
| Labor BOE- Assumes 25% each of a Fermilab and unversity physicist time as well as a FNAL EEF, spread over 3 months. | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1.6.2.12.3 | Move test setup to Lab C | | | | 8/18/04 | 8/31/04 | \$2,000 | | \$0 | \$1,360 | | | | \$3,360 |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.5 | 40 h | 0 w | 8/18/04 | 8/31/04 | \$1,360 | \$0 | \$0 | \$1,360 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 0.2 | 16 h | 0 w | 8/18/04 | 8/31/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| 48 | MandS | 2,000 | 2,000 | 0 w | 8/18/04 | 8/31/04 | \$2,000 | \$0 | \$0 | \$2,000 | | 0 | 0 | 2,000 |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | | | Start | Finish | | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | |
|---|-----------------------------------|----------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|
| "Move test setup to Lab C" continued | | | | | | | | | | | | | | | |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |
| Following the testing of adapter card schemes, the test setup will need to be moved to Lab C to conduct final tests with the full chain. | | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | | |
| Assumed to take 50% (1 week) of MTF time to disassemble, move, and reassemble the test set up. 2 days of physicist time is assumed to direct and assist in the move. | | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | | |
| \$2000 for assorted infrastructure. | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.12.4 | Test with final adapter cards | | | | | | 2/17/05 | 4/13/05 | | \$0 | \$0 | \$7,520 | \$7,520 | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 4 | ElecEngF | 0.25 | 80 h | 0 w | 2/17/05 | 4/13/05 | \$4,400 | \$0 | \$0 | \$4,400 | 0 h | 0 h | 0 h | 80 h |
| | 13 | ElecTechF | 0.25 | 80 h | 0 w | 2/17/05 | 4/13/05 | \$3,120 | \$0 | \$0 | \$3,120 | 0 h | 0 h | 0 h | 80 h |
| | 17 | PhysicistF | 0.25 | 80 h | 0 w | 2/17/05 | 4/13/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| | 18 | PhysicistU | 0.25 | 80 h | 0 w | 2/17/05 | 4/13/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |
| Test in Lab C using the final adapter card scheme. | | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | | |
| Assumes 25% each (two weeks) of a Fermilab physicist, a university physicist, EEF, and ETF, spread over 2 months. | | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | | |
| n/a | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.12.5 | Test full, final system | | | | | | 4/14/05 | 6/9/05 | | \$0 | \$0 | \$4,400 | \$4,400 | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 4 | ElecEngF | 0.25 | 80 h | 0 w | 4/14/05 | 6/9/05 | \$4,400 | \$0 | \$0 | \$4,400 | 0 h | 0 h | 0 h | 80 h |
| | 17 | PhysicistF | 0.5 | 160 h | 0 w | 4/14/05 | 6/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| | 18 | PhysicistU | 0.5 | 160 h | 0 w | 4/14/05 | 6/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |
| Complete test and debug of the full readout chain using the final readout system, including Adapter Card, Interface Board, Sequencer, VRB, VRB Controller and Single Board Computer with interface to Data Acquisition System, and all associated cables and power supplies. | | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | | |
| 50% (4 weeks) each of a Fermilab and university physicist and 75% (6 weeks) of an EEF is assumed. | | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | | |
| n/a | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.2.12.6 | Full Chain System Test Completed | | | | | | 6/9/05 | 6/9/05 | | \$0 | \$0 | \$0 | \$0 | | |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |
| Milestone: A succesful test of the full readout chain has been conducted. | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 1.6.3 | Mechanical Design and Fabrication | | | | | | 11/3/03 | 9/22/04 | | \$58,516 | \$89,032 | \$151,872 | \$299,420 | | |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |
| This summary element includes the development and fabrication of assembly fixtures, tooling, and support structures for sensors, readout components, and the fully assembled detector. Also included are mechanical and electrical infrastructure items such as mounting hardware, a detector cooling system, a dry-gas purge system, and equipment protection interlocks and detector status monitoring equipment. | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | |
|--|--|----------|----------|--------|-----------|------------|------------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| "Mechanical Design and Fabrication" continued | | | | | | | | | | | | | | |
| <u>Notes</u> | | | | | | | | | | | | | | |
| 1.6.3.1 | Support Structures Design | 11/3/03 | 2/13/04 | \$0 | \$30,564 | \$0 | \$30,564 | | | | | | | |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Summary task for the design of the layer 0 support structure. | | | | | | | | | | | | | | |
| 1.6.3.1.1 | Design mechanical structures | 11/3/03 | 12/16/03 | \$0 | \$14,040 | \$0 | \$14,040 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.3 | 72 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 72 h |
| 45 | SeniorMechEngU | 0.5 | 120 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| 46 | MechEngU | 0.5 | 120 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| 47 | Student | 1 | 240 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 240 h |
| 51 | InKind | 14,040 | 14,040 | 0 w | 11/3/03 | 12/16/03 | \$14,040 | \$0 | \$0 | \$14,040 | | 0 | 0 | 14,040 |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Design of support structures for L0. Creation and maintenance of detailed 3-d CAD solid model of these structures and all components mounted on them. This includes the silicon sensors, the hybrid chips, all cables and the cooling system. | | | | | | | | | | | | | | |
| Labor BOE- \$71/hrx120hrs=\$8520 (SMEU) \$26/hrx120hrs=\$3120 (MEU) \$10/hrx240hrs=\$2400 (STUD) ----- Total: \$14,040 | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.3.1.2 | Conduct finite element analysis (mechanical) | 11/3/03 | 12/16/03 | \$0 | \$3,550 | \$0 | \$3,550 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.21 | 50 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 50 h |
| 45 | SeniorMechEngU | 0.21 | 50 h | 0 w | 11/3/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 50 h |
| 51 | InKind | 3,550 | 3,550 | 0 w | 11/3/03 | 12/16/03 | \$3,550 | \$0 | \$0 | \$3,550 | | 0 | 0 | 3,550 |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Mechanical FEA analysis of the L0 structures for both stress and deflection considerations. | | | | | | | | | | | | | | |
| Labor BOE- \$71/hrx50hrs =\$3550 (SMEU) | | | | | | | | | | | | | | |
| M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.3.1.3 | Freeze Mechanical Parameters | 12/16/03 | 12/16/03 | \$0 | \$0 | \$0 | \$0 | | | | | | | |
| <u>Notes</u> | | | | | | | | | | | | | | |
| WBS Definition- Milestone: Mechanical parameters of the design are frozen to enable subsequent final design of other components, such as cable lengths, etc. | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|-----------|------------------------------------|-------|-------|-------|----------|---------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| 1.6.3.1.4 | Design cooling components/assembly | | | | 12/17/03 | 1/15/04 | \$0 | \$3,510 | \$0 | \$3,510 | | | | |
| | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.25 | 30 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 30 h |
| 45 | SeniorMechEngU | 0.25 | 30 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 30 h |
| 46 | MechEngU | 0.25 | 30 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 30 h |
| 47 | Student | 0.5 | 60 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| 51 | InKind | 3,510 | 3,510 | 0 w | 12/17/03 | 1/15/04 | \$3,510 | \$0 | \$0 | \$3,510 | | 0 | 0 | 3,510 |

Notes

WBS Definition-

Design the cooling tubes for the silicon sensors in L0. This includes mechanical integration with the support structure.

Labor BOE-

\$71/hrx30hrs=\$2130 (SMEU)

\$26/hrx30hrs=\$780 (MEU)

\$10/hrx60hrs=\$600 (STUD)

Total= \$3510

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|-----------|---|-------|-------|-------|----------|---------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.1.5 | Conduct finite element analysis (thermal) | | | | | | 12/17/03 | 1/15/04 | \$0 | \$1,704 | \$0 | \$1,704 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.1 | 12 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| 45 | SeniorMechEngU | 0.2 | 24 h | 0 w | 12/17/03 | 1/15/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 24 h |
| 51 | InKind | 1,704 | 1,704 | 0 w | 12/17/03 | 1/15/04 | \$1,704 | \$0 | \$0 | \$1,704 | | 0 | 0 | 1,704 |

Notes

WBS Definition-

Thermal FEA analysis of the cooling systems in L0.

Labor BOE-

\$71/hrx24hrs=\$1704 (SMEU)

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|-----------|---|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.1.6 | Integrate designs (sensors, grounding, cooling) | | | | | | 1/16/04 | 1/30/04 | \$0 | \$3,880 | \$0 | \$3,880 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.1 | 8 h | 0 w | 1/16/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 45 | SeniorMechEngU | 0.5 | 40 h | 0 w | 1/16/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 46 | MechEngU | 0.5 | 40 h | 0 w | 1/16/04 | 1/30/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 3,880 | 3,880 | 0 w | 1/16/04 | 1/30/04 | \$3,880 | \$0 | \$0 | \$3,880 | | 0 | 0 | 3,880 |

Notes

WBS Definition-

Ensure complete collaboration and interchange of information with FNAL staff to ensure that the L0 structure design meets all design requirements. Ensure compatibility with all required assembly and installation procedures.

Labor BOE-

\$71/hrx40hrs=\$2840 (SMEU)

26/hrx40hrs=\$1040 (MEU)

Total= \$3880

M&S BOE-

n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|-----------|------------------|----------------|-------|-------|-------|--------|---------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| 1.6.3.1.7 | Prepare drawings | | | | | 2/2/04 | 2/13/04 | \$0 | \$3,880 | \$0 | \$3,880 | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.1 | 8 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| | 45 | SeniorMechEngU | 0.5 | 40 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| | 46 | MechEngU | 0.5 | 40 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| | 51 | InKind | 3,880 | 3,880 | 0 w | 2/2/04 | 2/13/04 | \$3,880 | \$0 | \$0 | \$3,880 | | 0 | 0 | 3,880 |

Notes

WBS Definition-

Prepare the engineering and assembly drawings for the final design of the support structures.

Labor BOE-

\$71/hrx40hrs=\$2840 (SMEU)

\$26hrx40hrs=\$1040 (MEU)

Total= \$3880

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|---------|--|--------|---------|-------|----------|---------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.2 | Development and integration of design (FNAL) | | | | | | 12/17/03 | 6/28/04 | \$10,000 | \$0 | \$143,000 | \$153,000 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 1.5 | 1,560 h | 0 w | 12/17/03 | 6/28/04 | \$79,560 | \$0 | \$0 | \$79,560 | 0 h | 0 h | 0 h | 1,560 h |
| 9 | MechTechSF | 0.5 | 520 h | 0 d | 12/17/03 | 6/28/04 | \$17,680 | \$0 | \$0 | \$17,680 | 0 h | 0 h | 0 h | 520 h |
| 17 | PhysicistF | 0.25 | 260 h | 0 w | 12/17/03 | 6/28/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 260 h |
| 21 | DesignerF | 1 | 1,040 h | 0 w | 12/17/03 | 6/28/04 | \$45,760 | \$0 | \$0 | \$45,760 | 0 h | 0 h | 0 h | 1,040 h |
| 48 | MandS | 10,000 | 10,000 | 0 w | 12/17/03 | 6/28/04 | \$10,000 | \$0 | \$0 | \$10,000 | | 0 | 0 | 10,000 |

Notes

WBS Definition-

Coordination and documentation of UW and Fermilab efforts on Layer 0 taking into account the external cooling system and connections to it, dry gas systems, beam pipe installation and support, thermal, deflection, accuracy, cabling, monitoring, and electronics requirements, geometrical constraints, and assembly and installation requirements ; includes end supports, junction card supports, and final alignment.

Labor BOE-

A full time designer, 1.5 mechanical engineers, and 25% of a Fermilab physicist for about 6 months is required to produce an integrated design.

M&S BOE-

\$10,000 for assorted tooling and other integration/assembly hardware.

| | | | | | | | |
|---------|-----------------------------|---------|---------|-----|-------|-------|---------|
| 1.6.3.3 | Production Readiness Review | 2/16/04 | 2/20/04 | \$0 | \$776 | \$816 | \$1,592 |
|---------|-----------------------------|---------|---------|-----|-------|-------|---------|

Notes

WBS Definition-

Final design review and approval of support structures.

| | | | | | | | | | | | | | | |
|-----------|--|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.3.1 | Conduct production readiness review (UW) | | | | | | 2/16/04 | 2/20/04 | \$0 | \$776 | \$0 | \$776 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.4 | 16 h | 0 w | 2/16/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| 45 | SeniorMechEngU | 0.2 | 8 h | 0 w | 2/16/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 46 | MechEngU | 0.2 | 8 h | 0 w | 2/16/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 51 | InKind | 776 | 776 | 0 w | 2/16/04 | 2/20/04 | \$776 | \$0 | \$0 | \$776 | | 0 | 0 | 776 |

Notes

WBS Definition-

University of Washington effort on production readiness review for mechanical support structures.

Labor BOE-

\$71/hrx8hrs=\$568 (SMEU)

\$26/hrx8hrs=\$208 (MEU)

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---------|---------------|----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|------------|-----|------|-----|---------|---------|-------|-----|-----|-------|-----|-----|-----|------|----|----------------|-----|------|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|----------|-----|------|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|------|----|--------|-------|-------|-----|---------|---------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|
| "Conduct production readiness review (UW)" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> Total= \$776 M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.3.3.2 | Conduct production readiness review (Fermilab) | 2/16/04 | 2/20/04 | \$0 | \$0 | \$816 | \$816 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>1</td><td>MechEngF</td><td>0.4</td><td>16 h</td><td>0 w</td><td>2/16/04</td><td>2/20/04</td><td>\$816</td><td>\$0</td><td>\$0</td><td>\$816</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr><tr><td>17</td><td>PhysicistF</td><td>0.4</td><td>16 h</td><td>0 w</td><td>2/16/04</td><td>2/20/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>16 h</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 1 | MechEngF | 0.4 | 16 h | 0 w | 2/16/04 | 2/20/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | 17 | PhysicistF | 0.4 | 16 h | 0 w | 2/16/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MechEngF | 0.4 | 16 h | 0 w | 2/16/04 | 2/20/04 | \$816 | \$0 | \$0 | \$816 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | PhysicistF | 0.4 | 16 h | 0 w | 2/16/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Fermilab effort on production readiness review for mechanical support structures. Labor BOE- About 2 days each of MEF and PhysF effort spread over 1 week to review, approve, and document the resuts of the PRR. M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.3.3.3 | Support Structures Ready For Production | 2/20/04 | 2/20/04 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Milestone: Ready for production of final support structures by University of Washington. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.3.4 | Final Fabrication Tooling | 2/23/04 | 4/9/04 | \$10,344 | \$10,932 | \$0 | \$21,276 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Summary task that includes the design and fabrication of all tooling needed at UW for the fabrication of the L0 structures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.3.4.1 | Design final production tooling | 2/23/04 | 3/12/04 | \$0 | \$5,820 | \$0 | \$5,820 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>18</td><td>PhysicistU</td><td>0.1</td><td>12 h</td><td>0 w</td><td>2/23/04</td><td>3/12/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>12 h</td></tr><tr><td>45</td><td>SeniorMechEngU</td><td>0.5</td><td>60 h</td><td>0 w</td><td>2/23/04</td><td>3/12/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>60 h</td></tr><tr><td>46</td><td>MechEngU</td><td>0.5</td><td>60 h</td><td>0 w</td><td>2/23/04</td><td>3/12/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>60 h</td></tr><tr><td>51</td><td>InKind</td><td>5,820</td><td>5,820</td><td>0 w</td><td>2/23/04</td><td>3/12/04</td><td>\$5,820</td><td>\$0</td><td>\$0</td><td>\$5,820</td><td></td><td>0</td><td>0</td><td>5,820</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 18 | PhysicistU | 0.1 | 12 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h | 45 | SeniorMechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h | 46 | MechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h | 51 | InKind | 5,820 | 5,820 | 0 w | 2/23/04 | 3/12/04 | \$5,820 | \$0 | \$0 | \$5,820 | | 0 | 0 | 5,820 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.1 | 12 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | SeniorMechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 46 | MechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 5,820 | 5,820 | 0 w | 2/23/04 | 3/12/04 | \$5,820 | \$0 | \$0 | \$5,820 | | 0 | 0 | 5,820 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Design of tooling needed for carbon/epoxy part fabrication and assembly of the complete L0 structure and cooling system. Labor BOE- \$71/hrx60hrs=\$4260 (SMEU) \$26/hrx60hrs=\$1560 (MEU) ----- Total=\$5820 M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | |
|-----------|---|-------|-------|-------|---------|---------|---------|---------------|-----------|------------|------------|---------------|-----------|-----------|
| 1.6.3.4.2 | Prepare final production tooling drawings | | | | | 3/15/04 | 3/26/04 | \$0 | \$3,880 | \$0 | \$3,880 | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.1 | 8 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 45 | SeniorMechEngU | 0.5 | 40 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 46 | MechEngU | 0.5 | 40 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 3,880 | 3,880 | 0 w | 3/15/04 | 3/26/04 | \$3,880 | \$0 | \$0 | \$3,880 | | 0 | 0 | 3,880 |

Notes

WBS Definition-

Produce production drawings for the L0 production tooling.

Labor BOE-

\$71/hrx40hrs=\$2840 (SMEU)

\$26/hrx40hrs=\$1040 (MEU)

Total=\$3880

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|-----------|------------------------------------|--------|--------|-------|---------|--------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.4.3 | Fabricate final production tooling | | | | | | 3/29/04 | 4/9/04 | \$10,344 | \$1,232 | \$0 | \$11,576 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 46 | MechEngU | 0.4 | 32 h | 0 w | 3/29/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h |
| 47 | Student | 0.5 | 40 h | 0 w | 3/29/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 11,576 | 11,576 | 0 w | 3/29/04 | 4/9/04 | \$11,576 | \$0 | \$0 | \$11,576 | | 0 | 0 | 11,576 |

Notes

WBS Definition-

Fabricate L0 production tooling.

Labor BOE-

\$26/hrx32hrs=\$832 (MEU)

\$10/hrx40hrs=\$400 (STUD)

Total=\$1232

M&S BOE-

Machine shop estimates and materials needed to produce final production tooling. Cost in materials is \$400 and 150 hours of shop time for a charge of \$9,944. total=\$10,344

| | | | | | | | |
|---------|---------------------------------|---------|--------|----------|----------|-----|----------|
| 1.6.3.5 | Final Quality Assurance Tooling | 2/23/04 | 4/9/04 | \$13,258 | \$11,004 | \$0 | \$24,262 |
|---------|---------------------------------|---------|--------|----------|----------|-----|----------|

Notes

WBS Definition-

Summary task that includes the design, fabrication of all tooling needed at UW for the quality assurance of the Layer 0 structures.

| | | | | | | | | | | | | | | |
|-----------|-------------------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.5.1 | Design final QA tooling | | | | | | 2/23/04 | 3/12/04 | \$0 | \$5,820 | \$0 | \$5,820 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 18 | PhysicistU | 0.1 | 12 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| 45 | SeniorMechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| 46 | MechEngU | 0.5 | 60 h | 0 w | 2/23/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| 51 | InKind | 5,820 | 5,820 | 0 w | 2/23/04 | 3/12/04 | \$5,820 | \$0 | \$0 | \$5,820 | | 0 | 0 | 5,820 |

Notes

WBS Definition-

Design the tooling for the Quality Assurance of the layer 0 support structures.

Labor BOE-

\$71/hrx60 hrs=\$4260 (SMEU)

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|---|------|-------|--------|--------|-----------|------------|------------|
| "Design final QA tooling" continued | | | | | | | |
| <u>Notes</u> \$26/hrx60hrs=\$1560 (MEU) ----- Total= \$5820 M&S BOE- n/a | | | | | | | |

1.6.3.5.2

Prepare final QA tooling drawings

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.1 | 8 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 45 | SeniorMechEngU | 0.5 | 40 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 46 | MechEngU | 0.5 | 40 h | 0 w | 3/15/04 | 3/26/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 3,880 | 3,880 | 0 w | 3/15/04 | 3/26/04 | \$3,880 | \$0 | \$0 | \$3,880 | | 0 | 0 | 3,880 |

Notes

WBS Definition-

Prepapre engineering drawings for the tooling to be used for QA of the layer 0 aupport structures.

Labor BOE-

\$71/hrx40hrs=\$2840 (SMEU)

\$26/hrx40hrs=\$1040 (MEU)

Total=\$3880

M&S BOE-

n/a

1.6.3.5.3

Fabricate final QA tooling

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|--------|--------|-------|---------|--------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 46 | MechEngU | 0.5 | 40 h | 0 w | 3/29/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 47 | Student | 0.33 | 26.4 h | 0 w | 3/29/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 26.4 h |
| 51 | InKind | 14,562 | 14,562 | 0 w | 3/29/04 | 4/9/04 | \$14,562 | \$0 | \$0 | \$14,562 | | 0 | 0 | 14,562 |

Notes

WBS Definition-
Fabrication of the final QA tooling.

Labor BOE-
\$26/hrx40=\$1040
\$10/hrx26.4=\$264

Total= \$1304

M&S BOE-
Machine shop estimates for time and materials needed to fabricate final QA fixtures and tooling. Cost in materials is \$700 and 200 hours of shop time for a charge of \$13,258.

| | | | | | | | | | | | | | | | |
|-----------------|---|----------------|--------|--------|-------|---------|---------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.6 | Produce preproduction samples for testing | | | | | | | 4/12/04 | 5/21/04 | \$10,000 | \$7,020 | \$0 | \$17,020 | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.05 | 12 h | 0 w | 4/12/04 | 5/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| | 45 | SeniorMechEngU | 0.25 | 60 h | 0 w | 4/12/04 | 5/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| | 46 | MechEngU | 0.25 | 60 h | 0 w | 4/12/04 | 5/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 60 h |
| | 47 | Student | 0.5 | 120 h | 0 w | 4/12/04 | 5/21/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| | 51 | InKind | 17,020 | 17,020 | 0 w | 4/12/04 | 5/21/04 | \$17,020 | \$0 | \$0 | \$17,020 | | 0 | 0 | 17,020 |
| <u>Notes</u> | | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|--|-------|--------|--------|-----------|------------|------------|
| | "Produce preproduction samples for testing" continued | | | | | | |
| | <u>Notes</u> Preproduction samples of carbon fiber support structures for mechanical and module mounting tests. Labor BOE- \$71/hrx60hrs=\$4260 \$26/hrx60hrs=\$1560 \$10/hrx120hrs=\$1200 ----- Total=\$7020 M&S BOE- \$5000 -material costs \$5000 - shop time. ----- Total=\$10,000 | | | | | | |

| | | | | | | | |
|----------------|--|---------------|----------------|-----------------|-----------------|------------|-----------------|
| 1.6.3.7 | Final Support Structures Production | 2/2/04 | 8/24/04 | \$14,914 | \$28,736 | \$0 | \$43,650 |
|----------------|--|---------------|----------------|-----------------|-----------------|------------|-----------------|

Notes
WBS Definition-
The summary task that includes production and assembly of the L0 structures.

| | | | | | | | |
|------------------|---|---------------|----------------|------------|----------------|------------|----------------|
| 1.6.3.7.1 | Prepare final production and assembly drawings | 2/2/04 | 2/13/04 | \$0 | \$3,880 | \$0 | \$3,880 |
|------------------|---|---------------|----------------|------------|----------------|------------|----------------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|-------|-------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.1 | 8 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 45 | SeniorMechEngU | 0.5 | 40 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 46 | MechEngU | 0.5 | 40 h | 0 w | 2/2/04 | 2/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 3,880 | 3,880 | 0 w | 2/2/04 | 2/13/04 | \$3,880 | \$0 | \$0 | \$3,880 | | 0 | 0 | 3,880 |

Notes
WBS Definition-
Prepare the final production and assembly drawings for the layer 0 support structure.

Labor BOE-
71/hrx40hrs=\$2840
\$26/hrx40hrs=\$1040

Total=\$3880

M&S BOE-
n/a

| | | | | | | | |
|------------------|---|----------------|---------------|-----------------|-----------------|------------|-----------------|
| 1.6.3.7.2 | Procure/manufacture final production parts | 5/24/04 | 7/6/04 | \$14,714 | \$11,400 | \$0 | \$26,114 |
|------------------|---|----------------|---------------|-----------------|-----------------|------------|-----------------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|--------|--------|-------|---------|--------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.1 | 24 h | 0 w | 5/24/04 | 7/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 24 h |
| 45 | SeniorMechEngU | 0.5 | 120 h | 0 w | 5/24/04 | 7/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| 46 | MechEngU | 0.33 | 80 h | 0 w | 5/24/04 | 7/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 47 | Student | 0.33 | 80 h | 0 w | 5/24/04 | 7/6/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 51 | InKind | 26,114 | 26,114 | 0 w | 5/24/04 | 7/6/04 | \$26,114 | \$0 | \$0 | \$26,114 | | 0 | 0 | 26,114 |

Notes
WBS Definition-
Produce the final layer 0 support structure and procure final parts as applicable.

Labor BOE-
\$71/hrx120hrs=\$8520 (SMEU)
\$26/hrx80hrs=\$2080 (MEU)
\$10/hrx80hrs=\$800 (STUD)

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Procure/manufacture final production parts" continued

Notes

Total=\$11,400

M&S BOE-

Machine shop estimate based on hours to fabricate all machine parts. Material estimate based on cost of K13C Carbon-fibre pre-preg and associated fabrication materials needed to produce complete support structure and cooling system. Cost in materials is \$8085 and 100 hours of shop time for a charge of \$6,629. Total=\$14,714

1.6.3.7.3 Assemble final support structures 7/7/04 8/3/04 \$0 \$5,296 \$0 \$5,296

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|-------|-------|-------|--------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.3 | 48 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 45 | SeniorMechEngU | 0.3 | 48 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 46 | MechEngU | 0.3 | 48 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 47 | Student | 0.4 | 64 h | 0 w | 7/7/04 | 8/3/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 64 h |
| 51 | InKind | 5,296 | 5,296 | 0 w | 7/7/04 | 8/3/04 | \$5,296 | \$0 | \$0 | \$5,296 | | 0 | 0 | 5,296 |

Notes

WBS Definition-

The layer 0 support structure consists of an six sided carbon-fiber outer tube and a 12 sided inner tube along with various cooling components hybrid supports, and other parts. This tasks refers to the assembly of all mechanical components of the suport structure.

Labor BOE-

\$71/hrx48hrs= \$3408 (SMEU)

\$26/hrx48hrs= \$1248 (MEU)

\$10/hrx64hrs=\$640 (STUD)

Total=\$5296

M&S BOE-

n/a

1.6.3.7.4 Perform quality assurance checks on final support stru 8/4/04 8/17/04 \$0 \$8,160 \$0 \$8,160

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|-------|-------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.5 | 40 h | 0 w | 8/4/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 45 | SeniorMechEngU | 1 | 80 h | 0 w | 8/4/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 46 | MechEngU | 1 | 80 h | 0 w | 8/4/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 47 | Student | 0.5 | 40 h | 0 w | 8/4/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 51 | InKind | 8,160 | 8,160 | 0 w | 8/4/04 | 8/17/04 | \$8,160 | \$0 | \$0 | \$8,160 | | 0 | 0 | 8,160 |

Notes

WBS Definition-

Quality assurance of the final product, including deflection tests at the Unviersity of Washington.

Labor BOE-

\$71/hrx80hrs=\$5680 (SMEU)

\$26/hrx80hrs= \$2080 (MEU)

\$10/hrx40hrs=\$400 (STUD)

Total= \$8160

M&S BOE-

n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----------|----------------------------------|---------|---------|--------|-----------|------------|------------|
| 1.6.3.7.5 | All Support Structures Completed | 8/17/04 | 8/17/04 | \$0 | \$0 | \$0 | \$0 |

Notes
WBS Definition-
Milestone: The mechanical support structures have been fabricated, assembled, and checked that they meets specifications. (includes outer carbon fiber shell, if needed.)

| | | | | | | | | | | | | | | | |
|-----------|------------------|---------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.7.6 | Ship to Fermilab | | | | | | 8/18/04 | 8/24/04 | \$200 | \$0 | \$0 | \$200 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 18 | PhysicistU | 0.2 | 8 h | 0 w | 8/18/04 | 8/24/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| | 51 | InKind | 200 | 200 | 0 w | 8/18/04 | 8/24/04 | \$200 | \$0 | \$0 | \$200 | | 0 | 0 | 200 |

Notes
WBS Definition-
The final articles are shipped to Fermilab.

Labor BOE-
n/a

M&S BOE-
\$200-shipping

| | | | | | | | |
|-----------|---|---------|---------|-----|-----|-----|-----|
| 1.6.3.7.7 | All Support Structures Received At Fermilab | 8/24/04 | 8/24/04 | \$0 | \$0 | \$0 | \$0 |
|-----------|---|---------|---------|-----|-----|-----|-----|

Notes
WBS Definition-
Milestone: The final articles have been delivered to Fermilab

| | | | | | | | | | | | | | | | |
|---------|---|---------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.3.8 | Perform final article QA checks of support structure co | | | | | | | 8/25/04 | 9/22/04 | \$0 | \$0 | \$8,056 | \$8,056 | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 1 | MechEngF | 0.35 | 56 h | 0 w | 8/25/04 | 9/22/04 | \$2,856 | \$0 | \$0 | \$2,856 | 0 h | 0 h | 0 h | 56 h |
| | 9 | MechTechSF | 0.5 | 80 h | 0 w | 8/25/04 | 9/22/04 | \$2,720 | \$0 | \$0 | \$2,720 | 0 h | 0 h | 0 h | 80 h |
| | 17 | PhysicistF | 0.15 | 24 h | 0 w | 8/25/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 24 h |
| | 27 | CMMOperatorSF | 0.5 | 80 h | 0 w | 8/25/04 | 9/22/04 | \$2,480 | \$0 | \$0 | \$2,480 | 0 h | 0 h | 0 h | 80 h |
| | 32 | CMMLarge | 0.5 | 80 h | 0 d | 8/25/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |

Notes
WBS Definition-
Fermilab QA effort to check that delivered final articles meet specifications.

Labor BOE-
Two weeks each of a MTF and CMM operator, spread over one month, together with a MEF (35%) and a physicst (15%) to verify that the parts meet specifications. A CMM is also required.

M&S BOE-
n/a

| | | | | | | | |
|-------|--------------------------|---------|---------|----------|-----|----------|----------|
| 1.6.4 | Layer 0 Detector Modules | 11/3/03 | 5/16/05 | \$19,505 | \$0 | \$76,932 | \$96,437 |
|-------|--------------------------|---------|---------|----------|-----|----------|----------|

Notes
WBS Definition-
The summary task that includes the preproduction and production of all Layer 0 modules.

| | | | | | | | | | | | | | | | |
|---------|------------------------|----------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|
| 1.6.4.1 | Fabricate module boxes | | | | | | 3/15/04 | 6/7/04 | \$9,600 | \$0 | \$0 | \$9,600 | | | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 51 | InKind | 9,600 | 9,600 | 0 w | 3/15/04 | 6/7/04 | \$9,600 | \$0 | \$0 | \$9,600 | | 0 | 0 | 9,600 |

Notes
WBS Definition-
Vendor production of module boxes for storage, testing, and burn-in of assembled silicon modules.

Labor BOE-
n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|------------------------------------|---|---------|---------|---------|-----------|------------|------------|
| "Fabricate module boxes" continued | | | | | | | |
| | <u>Notes</u> | | | | | | |
| | M&S BOE- 96 boxes @ \$100 per box=\$9600 | | | | | | |
| 1.6.4.2 | Module Burn-in Stands Available | 11/3/03 | 11/3/03 | \$0 | \$0 | \$0 | \$0 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- Milestone: Module Burn-in stands are available from Run 2b project. | | | | | | |
| 1.6.4.3 | Production Module Fixtures | 2/23/04 | 7/27/04 | \$7,700 | \$0 | \$23,320 | \$31,020 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- Summary task that cover the production of the fixtures for making the Layer 0 readout modules and fixtures for wirebonding the modules. L0 modules consist of a sensor, analogue cables and hybrids. Fixtures are required for each assembly step. The first step is to glue ceramic spacers to the ends of the cables and to glue the cables to each other. The second step is to glue this cable pair to the sensor. The third step involves gluing the other end of the cable to the hybrid. The final step is to wire bond the cable to the sensor and hybrid. | | | | | | |
| 1.6.4.3.1 | Finalize readout module fabrication fixtures | 2/23/04 | 3/19/04 | \$0 | \$0 | \$15,200 | \$15,200 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- This task involves the development of final fixture designs and drawings for production of fixtures for each of the assembly steps. | | | | | | |
| | Labor BOE- A month each of DesF and MEF time, and two weeks of physicist time, to design and prepare drawings for the fixtures. | | | | | | |
| | M&S BOE- n/a | | | | | | |
| 1.6.4.3.2 | Procure production layer 0 readout module fixtures | 3/22/04 | 7/13/04 | \$5,800 | \$0 | \$0 | \$5,800 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- Machining and parts procurement for final fixtures. | | | | | | |
| | M&S BOE- Two sets of three fixtures. Material and part costs of \$100 per fixture. Machining time of 10 hrs for the cable gluing fixture and 20 hours each for the cable to sensor and cable to hybrid gluing fixtures. Total of 100 hrs @\$50/hr plus \$800 parts and materials for a total of \$5800. | | | | | | |
| | Labor BOE- University physicist is expected to spend 40 hrs to initiate and closeout fabrication during the first and last week of the fabrication cycle. An additional 4 hrs per week of oversight is added for the remainder of the production time. | | | | | | |
| 1.6.4.3.3 | QC production readout module fixtures | 7/14/04 | 7/27/04 | \$0 | \$0 | \$4,520 | \$4,520 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- Machining and parts procurement for final fixtures. | | | | | | |
| | M&S BOE- Two sets of three fixtures. Material and part costs of \$100 per fixture. Machining time of 10 hrs for the cable gluing fixture and 20 hours each for the cable to sensor and cable to hybrid gluing fixtures. Total of 100 hrs @\$50/hr plus \$800 parts and materials for a total of \$5800. | | | | | | |
| | Labor BOE- University physicist is expected to spend 40 hrs to initiate and closeout fabrication during the first and last week of the fabrication cycle. An additional 4 hrs per week of oversight is added for the remainder of the production time. | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"QC production readout module fixtures" continued

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 27 | CMMOperatorSF | 1 | 80 h | 0 w | 7/14/04 | 7/27/04 | \$2,480 | \$0 | \$0 | \$2,480 | 0 h | 0 h | 0 h | 80 h |
| 30 | CMMSmall | 1 | 80 h | 0 w | 7/14/04 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |

Notes

WBS Definition-

Verify that the fixtures meet specifications and perform as designed.

Labor BOE-

Assume full time measurements at CMM and consulting with an MEF to understand results; based on Run2a measurement times.

M&S BOE-

n/a

| | | | | | | | |
|-----------|----------------------------------|--------|---------|-----|-----|---------|---------|
| 1.6.4.3.4 | Finalize L0 wirebonding fixtures | 3/1/04 | 3/12/04 | \$0 | \$0 | \$2,780 | \$2,780 |
|-----------|----------------------------------|--------|---------|-----|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.25 | 20 h | 0 w | 3/1/04 | 3/12/04 | \$1,020 | \$0 | \$0 | \$1,020 | 0 h | 0 h | 0 h | 20 h |
| 17 | PhysicistF | 0.5 | 40 h | 0 w | 3/1/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 21 | DesignerF | 0.5 | 40 h | 0 w | 3/1/04 | 3/12/04 | \$1,760 | \$0 | \$0 | \$1,760 | 0 h | 0 h | 0 h | 40 h |

Notes

WBS Definition-

Finalize drawings and specifications for wirebonding fixtures.

Labor BOE-

Physicist and MEF working part time for 1 week to complete design changes and second week to review and approve drawings for fabrication of production parts. Designer at 50% throughout period to revise drawings as required.

M&S BOE-

n/a

| | | | | | | | |
|-----------|--|---------|--------|---------|-----|-----|---------|
| 1.6.4.3.5 | Procure production L0 wirebonding fixtures | 3/15/04 | 6/7/04 | \$1,900 | \$0 | \$0 | \$1,900 |
|-----------|--|---------|--------|---------|-----|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 18 | PhysicistU | 0.02 | 8 h | 0 d | 3/15/04 | 6/7/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 51 | InKind | 1,900 | 1,900 | 0 w | 3/15/04 | 6/7/04 | \$1,900 | \$0 | \$0 | \$1,900 | | 0 | 0 | 1,900 |

Notes

WBS Definition-

Machining and parts procurement for final fixtures.

M&S BOE-

Two fixtures (sensor end and hybrid end). Material and part costs of \$200 per fixture. Machining time of 15 hrs each. Total cost \$1900.

Labor BOE-

8 hrs of university physicist time is allocated to oversee shop work.

| | | | | | | | |
|-----------|---------------------------------------|--------|---------|-----|-----|-------|-------|
| 1.6.4.3.6 | QC production L0 wirebonding fixtures | 6/8/04 | 6/14/04 | \$0 | \$0 | \$820 | \$820 |
|-----------|---------------------------------------|--------|---------|-----|-----|-------|-------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|---------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.25 | 10 h | 0 w | 6/8/04 | 6/14/04 | \$510 | \$0 | \$0 | \$510 | 0 h | 0 h | 0 h | 10 h |
| 17 | PhysicistF | 0.3 | 12 h | 0 w | 6/8/04 | 6/14/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 12 h |
| 27 | CMMOperatorSF | 0.25 | 10 h | 0 w | 6/8/04 | 6/14/04 | \$310 | \$0 | \$0 | \$310 | 0 h | 0 h | 0 h | 10 h |
| 30 | CMMSmall | 0.25 | 10 h | 0 w | 6/8/04 | 6/14/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 10 h |

Notes

WBS Definition-

Verify that the remaining fixtures meet specifications and perform as designed.

Labor BOE-

Inspection of fixtures on the CMM with MEF and PhysF to understand measurement results.

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|---|------|-------|--------|--------|-----------|------------|------------|
| "QC production L0 wirebonding fixtures" continued | | | | | | | |

Notes

M&S BOE-
n/a

| | | | | | | | |
|---------|-----------------------|---------|--------|-------|-----|----------|----------|
| 1.6.4.4 | Preproduction Modules | 7/28/04 | 1/4/05 | \$617 | \$0 | \$24,180 | \$24,797 |
|---------|-----------------------|---------|--------|-------|-----|----------|----------|

Notes

WBS Definition-

Summary task covering the production of several pre-production modules to verify tooling and assembly procedures and the functionality of the produced modules. Includes mechanical design and integration of HV isolation and any required electrical shielding to eliminate noise pickup from the conductive support structure.

| | | | | | | | |
|-----------|---------------------------------|---------|---------|-------|-----|----------|----------|
| 1.6.4.4.1 | Qualify fixtures and procedures | 7/28/04 | 9/22/04 | \$100 | \$0 | \$16,080 | \$16,180 |
|-----------|---------------------------------|---------|---------|-------|-----|----------|----------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|----------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.5 | 160 h | 0 w | 7/28/04 | 9/22/04 | \$8,160 | \$0 | \$0 | \$8,160 | 0 h | 0 h | 0 h | 160 h |
| 9 | MechTechSF | 0.5 | 160 h | 0 w | 7/28/04 | 9/22/04 | \$5,440 | \$0 | \$0 | \$5,440 | 0 h | 0 h | 0 h | 160 h |
| 17 | PhysicistF | 0.25 | 80 h | 0 w | 7/28/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 27 | CMMSOperatorSF | 0.25 | 80 h | 0 w | 7/28/04 | 9/22/04 | \$2,480 | \$0 | \$0 | \$2,480 | 0 h | 0 h | 0 h | 80 h |
| 30 | CMMSsmall | 0.25 | 80 h | 0 w | 7/28/04 | 9/22/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 48 | MandS | 100 | 100 | 0 w | 7/28/04 | 9/22/04 | \$100 | \$0 | \$0 | \$100 | 0 h | 0 | 0 | 100 |

Notes

WBS Definition-

Verify that fixtures meet specifications and initial versions of production procedures are developed.

Labor BOE-

M&S BOE-
\$100-Assorted supplies

| | | | | | | | |
|-----------|-------------------------------|----------|----------|-------|-----|---------|---------|
| 1.6.4.4.2 | Produce preproduction modules | 11/29/04 | 12/10/04 | \$517 | \$0 | \$6,260 | \$6,777 |
|-----------|-------------------------------|----------|----------|-------|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------------|-------|------|-------|----------|----------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.15 | 12 h | 0 w | 11/29/04 | 12/10/04 | \$612 | \$0 | \$0 | \$612 | 0 h | 0 h | 0 h | 12 h |
| 9 | MechTechSF | 1 | 80 h | 0 w | 11/29/04 | 12/10/04 | \$2,720 | \$0 | \$0 | \$2,720 | 0 h | 0 h | 0 h | 80 h |
| 12 | ElecTechSF | 0.5 | 40 h | 0 w | 11/29/04 | 12/10/04 | \$1,320 | \$0 | \$0 | \$1,320 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 1 | 80 h | 0 w | 11/29/04 | 12/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 21 | DesignerF | 0.15 | 12 h | 0 w | 11/29/04 | 12/10/04 | \$528 | \$0 | \$0 | \$528 | 0 h | 0 h | 0 h | 12 h |
| 23 | WirebonderSF | 0.5 | 40 h | 0 w | 11/29/04 | 12/10/04 | \$1,080 | \$0 | \$0 | \$1,080 | 0 h | 0 h | 0 h | 40 h |
| 29 | WirebondingMachineF | 0.5 | 40 h | 0 w | 11/29/04 | 12/10/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 48 | MandS | 517 | 517 | 0 w | 11/29/04 | 12/10/04 | \$517 | \$0 | \$0 | \$517 | 0 h | 0 | 0 | 517 |

Notes

WBS Definition-

Produce/assemble several pre-production modules.

Labor BOE-

M&S BOE-
517- Glue and other supplies

| | | | | | | | |
|-----------|----------------------------|----------|--------|-----|-----|---------|---------|
| 1.6.4.4.3 | Test preproduction modules | 12/13/04 | 1/4/05 | \$0 | \$0 | \$1,840 | \$1,840 |
|-----------|----------------------------|----------|--------|-----|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|----------|--------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 9 | MechTechSF | 0.1 | 8 h | 0 w | 12/13/04 | 1/4/05 | \$272 | \$0 | \$0 | \$272 | 0 h | 0 h | 0 h | 8 h |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|--|---------------|-------|------|-------|----------|--------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| "Test preproduction modules" continued | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 12 | ElecTechSF | 0.5 | 40 h | 0 w | 12/13/04 | 1/4/05 | \$1,320 | \$0 | \$0 | \$1,320 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 1 | 80 h | 0 w | 12/13/04 | 1/4/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 27 | CMMOperatorSF | 0.1 | 8 h | 0 w | 12/13/04 | 1/4/05 | \$248 | \$0 | \$0 | \$248 | 0 h | 0 h | 0 h | 8 h |
| 37 | OGP | 0.1 | 8 h | 0 w | 12/13/04 | 1/4/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| Notes | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | |
| Test the assembled modules. | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | |

| 1.6.4.5 | Conduct L0 module production readiness review | 1/5/05 | 1/11/05 | \$0 | \$0 | \$680 | \$680 | | | | | | | |
|--|---|--------|---------|-------|--------|---------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 1 | MechEngF | 0.2 | 8 h | 0 w | 1/5/05 | 1/11/05 | \$408 | \$0 | \$0 | \$408 | 0 h | 0 h | 0 h | 8 h |
| 9 | MechTechSF | 0.2 | 8 h | 0 w | 1/5/05 | 1/11/05 | \$272 | \$0 | \$0 | \$272 | 0 h | 0 h | 0 h | 8 h |
| 17 | PhysicistF | 1 | 40 h | 0 w | 1/5/05 | 1/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| Notes | | | | | | | | | | | | | | |
| WBS Definition- | | | | | | | | | | | | | | |
| Establish the production readiness for Layer 0 module production. | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | |
| The physicist production line floor manager spends a few days preparing all the paperwork and establishing the procedures after the review. The review itself is expected to take a day, with participation of the lead mechanical technician, a mechanical engineer and a physicist | | | | | | | | | | | | | | |
| M&S BOE- | | | | | | | | | | | | | | |
| n/a | | | | | | | | | | | | | | |

| | | | | | | | |
|---|-------------------|---------|---------|---------|-----|----------|----------|
| 1.6.4.6 | Module Production | 1/12/05 | 5/16/05 | \$1,588 | \$0 | \$28,752 | \$30,340 |
| Notes | | | | | | | |
| WBS Definition- | | | | | | | |
| Summary task tcovering the production of Layer 0 modules, including their debugging, burn-in and repair, as needed. | | | | | | | |

| | | | | | | | |
|--|------------------------------------|---------|---------|-----|-----|-----|-----|
| 1.6.4.6.1 | Silicon L0 Module Production Begun | 1/18/05 | 1/18/05 | \$0 | \$0 | \$0 | \$0 |
| Notes | | | | | | | |
| WBS Definition- | | | | | | | |
| Milestone: Layer 0 final module production begins. | | | | | | | |

| 1.6.4.6.2 | Prepare sensors for module production | 1/12/05 | 3/9/05 | \$1,058 | \$0 | \$3,264 | \$4,322 | | | | | | | |
|---|---------------------------------------|---------|--------|---------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.3 | 96 h | 0 w | 1/12/05 | 3/9/05 | \$3,264 | \$0 | \$0 | \$3,264 | 0 h | 0 h | 0 h | 96 h |
| 17 | PhysicistF | 0.15 | 48 h | 0 w | 1/12/05 | 3/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 48 h |
| 48 | MandS | 1,058 | 1,058 | 0 w | 1/12/05 | 3/9/05 | \$1,058 | \$0 | \$0 | \$1,058 | | 0 | 0 | 1,058 |
| Notes | | | | | | | | | | | | | | |
| WBS Definitio- | | | | | | | | | | | | | | |
| lamination of kapton foil to back side of sensor, installation of HV filter card, and connect the foil to the HV filter card. | | | | | | | | | | | | | | |
| Labor BOE- | | | | | | | | | | | | | | |
| 1 hour per sensor of MTF time and 0.5 hours per sensor of physicist time | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|--|---|-------|--------|--------|-----------|------------|------------|
| "Prepare sensors for module production" continued | | | | | | | |
| | <u>Notes</u> M&S BOE- silver epoxy @ 11 per day * 2 * 40d=\$880 regular epoxy @ \$178 ----- total=\$1058 | | | | | | |

| 1.6.4.6.3 | Align and glue pair of flex cables | 1/18/05 | 3/14/05 | \$30 | \$0 | \$2,448 | \$2,478 | | | | | | | |
|-----------|------------------------------------|---------|---------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.23 | 72 h | 0 w | 1/18/05 | 3/14/05 | \$2,448 | \$0 | \$0 | \$2,448 | 0 h | 0 h | 0 h | 72 h |
| 17 | PhysicstF | 0.13 | 40 h | 0 w | 1/18/05 | 3/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 48 | MandS | 30 | 30 | 0 w | 1/18/05 | 3/14/05 | \$30 | \$0 | \$0 | \$30 | | 0 | 0 | 30 |

Notes
WBS Definition-
An analogue cable consists of a set of two laminated cables. This task refers to the lamination of these two cables.

M&S BOE-
Epoxy cost based on one 10cc mix per day with an anticipated cost of \$1500 for 20 liters of epoxy, including purity testing (\$0.75 per 10cc). The total of \$30 is 40 days times \$0.75 per day.

Labor BOE-
There are 12 each of 4 types of modules differing in the analogue cable lengths, sensor length and pitch, plus 6 spares of each module type, for a total of 72 modules to be built with one cable pair per module. A production rate of 2 modules per day leads to about a 7 week production cycle. An additional week is allocated for startup. (8 week total). Assembly time of 1 hr per cable pair, for a mechanical tech effort of 72 hrs. The physicist is responsible to tracking part flow and ensuring quality control with an anticipated effort of 1 hour per day.

| | | | | | | | | | | | | | | |
|-----------|-------------------------------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.4.6.4 | Align and glue sensor to flex cable | | | | | | 1/20/05 | 3/16/05 | \$470 | \$0 | \$2,448 | \$2,918 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.23 | 72 h | 0 w | 1/20/05 | 3/16/05 | \$2,448 | \$0 | \$0 | \$2,448 | 0 h | 0 h | 0 h | 72 h |
| 17 | PhysicistF | 0.13 | 40 h | 0 w | 1/20/05 | 3/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 48 | MandS | 470 | 470 | 0 w | 1/20/05 | 3/16/05 | \$470 | \$0 | \$0 | \$470 | | 0 | 0 | 470 |

Notes
WBS Definition-
Aligning sensor to flex cable and gluing it.

M&S BOE-
One package of silver epoxy per day for all required connections on all L0 modules in production at \$11 each (\$440 total). Additional \$30 for high purity epoxy (see previous line). Total=\$470

Labor BOE-
There are 12 each of 4 types of modules differing in the analogue cable lengths, sensor length and pitch, plus 6 spares of each module type, for a total of 72 modules to be built with one cable pair per module. A production rate of 2 modules per day leads to about a 7 week production cycle. An additional week is allocated for startup. (8 week total). Assembly time of 1 hr per cable pair, for a mechanical tech effort of 72 hrs. The physicist is responsible to tracking part flow and ensuring quality control with an anticipated effort of 1 hour per day.

| | | | | | | | | | | | | | | | |
|-----------|--|---------------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.4.6.5 | Perform sensor-to-flex cable wirebonds | | | | | 1/24/05 | 3/18/05 | \$0 | \$0 | \$3,888 | \$3,888 | | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 17 | PhysicistF | 0.45 | 144 h | 0 w | 1/24/05 | 3/18/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 144 h |
| | 23 | WirebonderSF | 0.45 | 144 h | 0 w | 1/24/05 | 3/18/05 | \$3,888 | \$0 | \$0 | \$3,888 | 0 h | 0 h | 0 h | 144 h |
| | 29 | WirebondingMachineF | 0.45 | 144 h | 0 w | 1/24/05 | 3/18/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 144 h |

Notes
WBS Definition-
Wirebonding sensor to flex cable.

Labor BOE-
There are 12 each of 4 types of modules differing in the analogue cable lengths, sensor length and pitch, plus 6 spares of each module type, for a total of 72 modules to be built with one cable pair per module. A production rate of 2 modules per day leads to about a 7 week production cycle. An additional week is allocated for startup. (8 week total). Bonding time is 1 hour/unit. Estimated time is then doubled to account for problem parts and/or equipment, based on prior experience.

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Perform sensor-to-flex cable wirebonds" continued

Notes

M&S BOE-
n/a

1.6.4.6.6 Attach end hybrids to flex cable 1/26/05 3/22/05 \$30 \$0 \$2,448 \$2,478

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 9 | MechTechSF | 0.23 | 72 h | 0 w | 1/26/05 | 3/22/05 | \$2,448 | \$0 | \$0 | \$2,448 | 0 h | 0 h | 0 h | 72 h |
| 17 | PhysicistF | 0.23 | 72 h | 0 w | 1/26/05 | 3/22/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 72 h |
| 48 | MandS | 30 | 30 | 0 w | 1/26/05 | 3/22/05 | \$30 | \$0 | \$0 | \$30 | 0 | 0 | 0 | 30 |

Notes

WBS Definition-
Gluing the hybrid to the flex cable.

M&S BOE-

Epoxy cost based on one 10cc mix per day with an anticipated cost of \$1500 for 20 liters of epoxy, including purity testing (\$0.75 per 10cc). The total of \$30 is 40 days times \$0.75 per day.

Labor BOE-

There are 12 each of 4 types of modules differing in the analogue cable lengths, sensor length and pitch, plus 6 spares of each module type, for a total of 72 modules to be built with one cable pair per module. A production rate of 2 modules per day leads to about a 7 week production cycle. An additional week is allocated for startup. (8 week total). Assembly time of 1 hr per cable pair, for a mechanical tech effort of 72 hrs. The physicist is responsible to tracking part flow and ensuring quality control with an anticipated effort of 1 hour per day.

1.6.4.6.7 Wirebond end hybrid to flex cable 1/28/05 3/24/05 \$0 \$0 \$3,888 \$3,888

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 17 | PhysicistF | 0.45 | 144 h | 0 w | 1/28/05 | 3/24/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 144 h |
| 23 | WirebonderSF | 0.45 | 144 h | 0 w | 1/28/05 | 3/24/05 | \$3,888 | \$0 | \$0 | \$3,888 | 0 h | 0 h | 0 h | 144 h |
| 29 | WirebondingMachineF | 0.45 | 144 h | 0 w | 1/28/05 | 3/24/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 144 h |

Notes

WBS Definition-
Wirebonding hybrid to flex cable.

Labor BOE-

There are 12 each of 4 types of modules differing in the analogue cable lengths, sensor length and pitch, plus 6 spares of each module type, for a total of 72 modules to be built with one cable pair per module. A production rate of 2 modules per day leads to about a 7 week production cycle. An additional week is allocated for startup. (8 week total). Bonding time is 1 hour/unit. Estimated time is then doubled to account for problem parts and/or equipment, based on prior experience.

M&S BOE-

n/a

1.6.4.6.8 Silicon L0 Module Production Complete 3/24/05 3/24/05 \$0 \$0 \$0 \$0

Notes

WBS Definition-
Milestone: All modules for Layer 0 have been produced.

1.6.4.6.9 Debug sensor modules 2/1/05 3/28/05 \$0 \$0 \$5,280 \$5,280

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-----------------|-------|-------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 12 | ElecTechSF | 0.5 | 160 h | 0 w | 2/1/05 | 3/28/05 | \$5,280 | \$0 | \$0 | \$5,280 | 0 h | 0 h | 0 h | 160 h |
| 34 | SASEQTestStandF | 1 | 320 h | 0 w | 2/1/05 | 3/28/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 44 | PostDoc | 0.5 | 160 h | 0 w | 2/1/05 | 3/28/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |

Notes

WBS Definition-
First functionality test of module after construction, consisting of visual inspection, functionality test without biasing the detector, biasing of the detector and characterization of the module by determining IV and V-noise curves. Noisy channels are removed by pulling wirebonds.

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Debug sensor modules" continued

Notes

Labor BOE-

Testing of 72 modules, ~10 modules/week plus start-up time to give an 8 week debugging period. 50% of a physicist devoted to this effort for the 8 week period. ElecTech (at 50%) pulls bonds on bad channels in preparation for burn-in. Physicist debugs module and sends modules that fail to the "evaluate and repair" task. Assume 10% of modules fail; Estimate based on Run IIa experience.

M&S BOE-

n/a

1.6.4.6.10 Burn-in sensor modules 2/8/05 4/4/05 \$0 \$0 \$0 \$0

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-------------------|-------|-------|-------|--------|--------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 40 | ModuleBurnInStand | 1 | 320 h | 0 w | 2/8/05 | 4/4/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 44 | PostDoc | 1 | 320 h | 0 w | 2/8/05 | 4/4/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 47 | Student | 1 | 320 h | 0 w | 2/8/05 | 4/4/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |

Notes

WBS Definition-

The QC procedure where modules are readout out under bias voltage for a few days and evaluated for bad channels.

Labor BOE-

Burn-in of 72 modules for 3 day cycle each. The burn-in stand accomodates up to 32 modules per cycle with 2 cycles per week. We anticipate needing to reprocess 10% of the modules. The L0 module production rate of 10/week, with 10% reprocessing means that 11 modules need to be burned-in per week. The stand has a total capacity of 64 modules per week. Thus, on average, only 20% of a module burn-in resource is used over the task duration. We assign a stand full-time to this effort. A student and postdoc are also assigned fulltime to the burn-in effort to install and remove modules and document results.

M&S BOE-

n/a

1.6.4.6.11 Evaluate and repair sensor modules 2/22/05 4/18/05 \$0 \$0 \$5,088 \$5,088

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 12 | ElecTechSF | 0.4 | 128 h | 0 w | 2/22/05 | 4/18/05 | \$4,224 | \$0 | \$0 | \$4,224 | 0 h | 0 h | 0 h | 128 h |
| 23 | WirebonderSF | 0.1 | 32 h | 0 w | 2/22/05 | 4/18/05 | \$864 | \$0 | \$0 | \$864 | 0 h | 0 h | 0 h | 32 h |
| 29 | WirebondingMachineF | 0.1 | 32 h | 0 w | 2/22/05 | 4/18/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 32 h |
| 34 | SASEQTestStandF | 1 | 320 h | 0 w | 2/22/05 | 4/18/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 44 | PostDoc | 0.4 | 128 h | 0 w | 2/22/05 | 4/18/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 128 h |

Notes

WBS Definition-

Determining what repairs are necessary and repairing broken wirebonds, bad hybrids, or bad bias connections

Labor BOE-

We assume that 10% of the modules(ie. 8 modules) fail the debugging task. It takes twice as long to diagnose and repair problematic modules, so it takes 1 day/module to repair. After the module has been repaired it needs to be debugged again. To debug these failed modules again takes 1 day. Thus, about 16 days of physicist and electrical tech repair and debugging effort is assumed (128 hrs each). A SASEQTestStandF full time is assumed to available, and a WirebonderSF and wirebonding machine at the 10% level.

1.6.4.6.12 Perform quality assurance tests 2/8/05 5/16/05 \$0 \$0 \$0 \$0

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-----------------|-------|-------|-------|--------|---------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 34 | SASEQTestStandF | 1 | 560 h | 0 w | 2/8/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 560 h |
| 44 | PostDoc | 0.54 | 300 h | 0 w | 2/8/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 300 h |
| 47 | Student | 0.54 | 300 h | 0 w | 2/8/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 300 h |

Notes

WBS Definition-

Quality assurance of a subset of modules to fully characterize their performance.

Labor BOE-

We assume that 20% (~15) of the modules are submitted to extensive tests, including laser test, temperature cycling, probe and pull testing and possibly irradiation tests. A postdoc and student will be occupied half time (20 hrs each) for one week per module. A SASEQ test stand is allocated full-time to this effort.

M&S BOE-

n/a

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---------|---------------|----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|----------|-------|-------|-----|---------|---------|---------|-----|-----|---------|-----|-----|-----|-------|----|------------|------|-----|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|-----|----|-----------|-----|------|-----|---------|---------|---------|-----|-----|---------|-----|-----|-----|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| "Perform quality assurance tests" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.4.6.13 | Silicon L0 Module Production and Testing Comple | 5/16/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WBS Definition- Milestone: All modules for Layer 0 have been produced and tested. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5 | Final Detector Integration and Assembly | 11/3/03 | 7/21/05 | \$49,700 | \$0 | \$104,462 | \$154,162 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WBS Definition- Summary task covering the work to fully integrate and assemble the various detector components into the final detector, including developing and certifying procedures, the mounting of sensor modules onto the support structure, the production of fixtures necessary to hold components during the assembly process, checkout and insertion of the beryllium beam pipe, electrical and mechanical checkout of components during and after assembly, installation of temperature monitoring hardware, and software and simulation. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.1 | Layer 0 Support Structure Holding Fixtures | 2/16/04 | 5/14/04 | \$5,000 | \$0 | \$9,528 | \$14,528 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WBS Definition- Summary task covering design, engineering, fabrication, testing, QC, and documentation (including drawings) necessary to obtain fully operational fixtures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.1.1 | Design support structure holding fixtures | 2/16/04 | 3/12/04 | \$0 | \$0 | \$7,600 | \$7,600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>1</td><td>MechEngF</td><td>0.5</td><td>80 h</td><td>0 w</td><td>2/16/04</td><td>3/12/04</td><td>\$4,080</td><td>\$0</td><td>\$0</td><td>\$4,080</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr><tr><td>17</td><td>PhysicistF</td><td>0.05</td><td>8 h</td><td>0 w</td><td>2/16/04</td><td>3/12/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>8 h</td></tr><tr><td>21</td><td>DesignerF</td><td>0.5</td><td>80 h</td><td>0 w</td><td>2/16/04</td><td>3/12/04</td><td>\$3,520</td><td>\$0</td><td>\$0</td><td>\$3,520</td><td>0 h</td><td>0 h</td><td>0 h</td><td>80 h</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 1 | MechEngF | 0.5 | 80 h | 0 w | 2/16/04 | 3/12/04 | \$4,080 | \$0 | \$0 | \$4,080 | 0 h | 0 h | 0 h | 80 h | 17 | PhysicistF | 0.05 | 8 h | 0 w | 2/16/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h | 21 | DesignerF | 0.5 | 80 h | 0 w | 2/16/04 | 3/12/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MechEngF | 0.5 | 80 h | 0 w | 2/16/04 | 3/12/04 | \$4,080 | \$0 | \$0 | \$4,080 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | PhysicistF | 0.05 | 8 h | 0 w | 2/16/04 | 3/12/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | DesignerF | 0.5 | 80 h | 0 w | 2/16/04 | 3/12/04 | \$3,520 | \$0 | \$0 | \$3,520 | 0 h | 0 h | 0 h | 80 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WBS Definition- Design the support structure holding fixtures used during detector assembly, integration and testing. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Labor BOE- Two weeks of an engineer and a designer, spread over a month, to finalize the design and produce the drawings. Based on Run2a experience with cylinder support and module installation fixtures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.1.2 | Procure support structure holding fixtures | 3/15/04 | 5/7/04 | \$5,000 | \$0 | \$0 | \$5,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>51</td><td>InKind</td><td>5,000</td><td>5,000</td><td>0 w</td><td>3/15/04</td><td>5/7/04</td><td>\$5,000</td><td>\$0</td><td>\$0</td><td>\$5,000</td><td></td><td>0</td><td>0</td><td>5,000</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 51 | InKind | 5,000 | 5,000 | 0 w | 3/15/04 | 5/7/04 | \$5,000 | \$0 | \$0 | \$5,000 | | 0 | 0 | 5,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 5,000 | 5,000 | 0 w | 3/15/04 | 5/7/04 | \$5,000 | \$0 | \$0 | \$5,000 | | 0 | 0 | 5,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | WBS Definition- Procure/fabricate the support structure holding fixtures used during detector assembly, integration and testing. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Labor BOE- n/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | M&S BOE- Cost per fixture is that of a Run 2a fixture to hold and position barrels during ladder installation. Materials and shop time = \$5000. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | | | Finish | | | M&S EQ | | M&S Labor | | FNAL Labor | | Total Cost | |
|-----------|--|---------------|-------|------|---------|---------|---------|---------|---------------|-----------|-----------|------------|---------------|------------|-----------|
| 1.6.5.1.3 | QC support structure holding fixtures | 5/10/04 | | | 5/14/04 | | | \$0 | | \$0 | | \$1,928 | | \$1,928 | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 1 | MechEngF | 0.2 | 8 h | 0 w | 5/10/04 | 5/14/04 | \$408 | \$0 | \$0 | \$408 | 0 h | 0 h | 0 h | 8 h |
| | 8 | MechTechF | 0.2 | 8 h | 0 w | 5/10/04 | 5/14/04 | \$280 | \$0 | \$0 | \$280 | 0 h | 0 h | 0 h | 8 h |
| | 17 | PhysicistF | 0.05 | 2 h | 0 w | 5/10/04 | 5/14/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 2 h |
| | 27 | CMMOperatorSF | 1 | 40 h | 0 w | 5/10/04 | 5/14/04 | \$1,240 | \$0 | \$0 | \$1,240 | 0 h | 0 h | 0 h | 40 h |
| | 32 | CMMLarge | 1 | 40 h | 0 w | 5/10/04 | 5/14/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- | | | | | | | | | | | | | | |
| | Ensure that the support structure holding fixtures used during detector assembly, integration and testing, meet specifications. | | | | | | | | | | | | | | |
| | Labor BOE- | | | | | | | | | | | | | | |
| | A day of MEF and MTF time is assumed to verify that the fixturing meets specifications. A CMM and operator is assumed to be available for a week to support this effort. | | | | | | | | | | | | | | |
| | M&S BOE- | | | | | | | | | | | | | | |
| | n/a | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---------|---|---------|--|--|---------|--|--|----------|--|-----|--|----------|--|----------|--|
| 1.6.5.2 | Layer 0 Module Installation Fixtures | 2/16/04 | | | 7/13/04 | | | \$12,000 | | \$0 | | \$16,988 | | \$28,988 | |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- | | | | | | | | | | | | | | |
| | Summary task covering the fixtures used to lift, position, align, and hold L0 modules as they are attached to a L0 support structure. | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|-----------|---|---------------|-------|-------|--------|---------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.2.1 | Design module installation fixtures | 2/16/04 | | | 4/9/04 | | | \$0 | | \$0 | | \$15,200 | | \$15,200 | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 1 | MechEngF | 0.5 | 160 h | 0 w | 2/16/04 | 4/9/04 | \$8,160 | \$0 | \$0 | \$8,160 | 0 h | 0 h | 0 h | 160 h |
| | 17 | PhysicistF | 0.2 | 64 h | 0 w | 2/16/04 | 4/9/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 64 h |
| | 21 | DesignerF | 0.5 | 160 h | 0 w | 2/16/04 | 4/9/04 | \$7,040 | \$0 | \$0 | \$7,040 | 0 h | 0 h | 0 h | 160 h |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- | | | | | | | | | | | | | | |
| | Design the module installation fixtures used during detector assembly and integration. | | | | | | | | | | | | | | |
| | Labor BOE- | | | | | | | | | | | | | | |
| | 4 weeks each of DesF and MEF effort to produce the final design and engineering drawings of the module installation fixtures. | | | | | | | | | | | | | | |
| | M&S BOE- | | | | | | | | | | | | | | |
| | n/a | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|-----------|--|---------------|--------|--------|--------|---------|--------|----------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.2.2 | Procure module installation fixtures | 4/12/04 | | | 7/6/04 | | | \$12,000 | | \$0 | | \$0 | | \$12,000 | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 51 | InKind | 12,000 | 12,000 | 0 w | 4/12/04 | 7/6/04 | \$12,000 | \$0 | \$0 | \$12,000 | | 0 | 0 | 12,000 |
| | <u>Notes</u> | | | | | | | | | | | | | | |
| | WBS Definition- | | | | | | | | | | | | | | |
| | Procure /fabricate the fixtures to lift, position, align, and hold L0 modules as they are attached to the L0 support structure. | | | | | | | | | | | | | | |
| | M&S BOE- | | | | | | | | | | | | | | |
| | The fixturing requires precision 5-axis positioning capability for sensors plus the ability to hold and position hybrids independently. Total cost for Materials and shop time: \$12,000 | | | | | | | | | | | | | | |
| | Labor BOE- | | | | | | | | | | | | | | |
| | n/a | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | | Finish | | M&S EQ | | M&S Labor | | FNAL Labor | | Total Cost | |
|-----------|---------------------------------|---------------|-------|------|--------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|------------|------|
| 1.6.5.2.3 | QC module installation fixtures | | | | 7/7/04 | | 7/13/04 | | \$0 | | \$0 | | \$1,788 | | \$1,788 | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | |
| | 1 | MechEngF | 0.2 | 8 h | 0 w | 7/7/04 | 7/13/04 | \$408 | \$0 | \$0 | \$408 | 0 h | 0 h | 0 h | 0 h | 8 h |
| | 8 | MechTechF | 0.1 | 4 h | 0 w | 7/7/04 | 7/13/04 | \$140 | \$0 | \$0 | \$140 | 0 h | 0 h | 0 h | 0 h | 4 h |
| | 17 | PhysicistF | 0.1 | 4 h | 0 w | 7/7/04 | 7/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 0 h | 4 h |
| | 27 | CMMOperatorSF | 1 | 40 h | 0 w | 7/7/04 | 7/13/04 | \$1,240 | \$0 | \$0 | \$1,240 | 0 h | 0 h | 0 h | 0 h | 40 h |
| | 31 | CMMMedium | 1 | 40 h | 0 w | 7/7/04 | 7/13/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 0 h | 40 h |

Notes

WBS Definition-

Ensure that the module installation fixtures used during detector assembly and integration meet specifications.

Labor BOE-

A day of MEF and a half-day of MTF time is assumed to verify that the fixturing meets specifications. A CMM and operator is assumed to be available for a week to support this effort.

M&S BOE-

n/a

| | | | | | | | | | | | | | | | |
|---------|--------------------------------------|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.3 | Design and fabricate detector garage | | | | | | 7/14/04 | 7/27/04 | \$1,000 | \$0 | \$1,248 | \$2,248 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 9 | MechTechSF | 0.2 | 16 h | 0 w | 7/14/04 | 7/27/04 | \$544 | \$0 | \$0 | \$544 | 0 h | 0 h | 0 h | 16 h |
| | 21 | DesignerF | 0.2 | 16 h | 0 w | 7/14/04 | 7/27/04 | \$704 | \$0 | \$0 | \$704 | 0 h | 0 h | 0 h | 16 h |
| | 48 | MandS | 1,000 | 1,000 | 0 w | 7/14/04 | 7/27/04 | \$1,000 | \$0 | \$0 | \$1,000 | | 0 | 0 | 1,000 |

Notes

WBS Definition-

Design and fabricate a protective enclosure for the detector to be used at various times during the assembly process.

Labor BOE-

Two days of a designer to produce drawings and two days of an MTF to assemble and build the enclosure.

M&S BOE-

\$1000 for parts and supplies

| | | | | | | | | | | | | | | | |
|---------|------------------------------------|-----------------|-------|------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.4 | Certify module mounting procedures | | | | | | 1/5/05 | 1/11/05 | \$100 | \$0 | \$5,688 | \$5,788 | | | |
| | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| | 1 | MechEngF | 0.2 | 8 h | 0 w | 1/5/05 | 1/11/05 | \$408 | \$0 | \$0 | \$408 | 0 h | 0 h | 0 h | 8 h |
| | 8 | MechTechF | 0.2 | 8 h | 0 w | 1/5/05 | 1/11/05 | \$280 | \$0 | \$0 | \$280 | 0 h | 0 h | 0 h | 8 h |
| | 17 | PhysicistF | 0.5 | 20 h | 0 w | 1/5/05 | 1/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h |
| | 27 | CMMOperatorSF | 1 | 40 h | 0 w | 1/5/05 | 1/11/05 | \$1,240 | \$0 | \$0 | \$1,240 | 0 h | 0 h | 0 h | 40 h |
| | 28 | CMMProgrammerSF | 2 | 80 h | 0 w | 1/5/05 | 1/11/05 | \$3,760 | \$0 | \$0 | \$3,760 | 0 h | 0 h | 0 h | 80 h |
| | 32 | CMMLarge | 1 | 40 h | 0 w | 1/5/05 | 1/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| | 48 | MandS | 100 | 100 | 0 w | 1/5/05 | 1/11/05 | \$100 | \$0 | \$0 | \$100 | | 0 | 0 | 100 |

Notes

WBS Definition-

Mount preproduction modules on preproduction structural support to verify mounting procedures.

Labor BOE-

2 weeks of CMM programming development. 1 week of CMM time with a CMM operator to finalize module mounting procedures; a half-week of a physicist, and one day each of a MEF and MTF over the course of one calendar week.

M&S BOE-

Assorted supplies - \$100

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | | | | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | |
|---------|------------------------------|-------|-------|-------|---------|--------|---------|---------------|------------|------------|-----------|---------------|-----------|-----------|
| 1.6.5.5 | Mount layer 0 sensor modules | | | | 3/15/05 | 5/9/05 | \$600 | \$0 | \$10,400 | \$11,000 | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.5 | 160 h | 0 w | 3/15/05 | 5/9/05 | \$5,440 | \$0 | \$0 | \$5,440 | 0 h | 0 h | 0 h | 160 h |
| 17 | PhysicistF | 0.5 | 160 h | 0 w | 3/15/05 | 5/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 18 | PhysicistU | 0.5 | 160 h | 0 w | 3/15/05 | 5/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 27 | CMMOperatorSF | 0.5 | 160 h | 0 w | 3/15/05 | 5/9/05 | \$4,960 | \$0 | \$0 | \$4,960 | 0 h | 0 h | 0 h | 160 h |
| 32 | CMMLarge | 1 | 320 h | 0 w | 3/15/05 | 5/9/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 320 h |
| 48 | MandS | 600 | 600 | 0 w | 3/15/05 | 5/9/05 | \$600 | \$0 | \$0 | \$600 | | 0 | 0 | 600 |

Notes

WBS Definition-

Mount sensor modules on Layer 0 support structure

Labor BOE-

Assume 2 physicists, one CMM operator and 1 MTF each working 50%, will mount 1 module per day (36 modules total) + 4 days for setup= 8 weeks.

M&S BOE-

Assorted supplies - \$600

| | | | | | | | | | | | | | | | |
|---------|-------------------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|--|
| 1.6.5.6 | Verify sensor alignment | | | | | 5/10/05 | 5/16/05 | \$0 | | \$0 | | \$1,920 | | \$1,920 | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | |
| 9 | MechTechSF | 0.5 | 20 h | 0 w | 5/10/05 | 5/16/05 | \$680 | \$0 | \$0 | \$680 | 0 h | 0 h | 0 h | 20 h | |
| 17 | PhysicistF | 0.5 | 20 h | 0 w | 5/10/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h | |
| 27 | CMMOperatorSF | 1 | 40 h | 0 w | 5/10/05 | 5/16/05 | \$1,240 | \$0 | \$0 | \$1,240 | 0 h | 0 h | 0 h | 40 h | |
| 32 | CMMLarge | 1 | 40 h | 0 w | 5/10/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h | |
| 44 | PostDoc | 0.5 | 20 h | 0 w | 5/10/05 | 5/16/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h | |

Notes

WBS Definition-

Make detailed QC measurements on CMM and analyze measurements to certify mechanical precision.

Labor BOE-

Based on Run2a experience, full time CMM measurements will be done for 1 week; 50% of a physicist, postdoc, and MTF participate.

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|---------|-----------------------------|-------|------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.7 | Install temperature sensors | | | | | | 5/17/05 | 5/23/05 | | \$0 | \$0 | \$1,360 | \$1,360 | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 1 | 40 h | 0 w | 5/17/05 | 5/23/05 | \$1,360 | \$0 | \$0 | \$1,360 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 0.5 | 20 h | 0 w | 5/17/05 | 5/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 20 h |
| 18 | PhysicistU | 1 | 40 h | 0 w | 5/17/05 | 5/23/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |

Notes

WBS Definition-

Place RTD temperature monitors on the L0 support structure and silicon.

Labor BOE-

Assume that task takes one full week with full time MechTech. The installation physicist supervisor is there 50% of the time and the supervising physicist who designed and made sensors is there all the time.

M&S BOE-

n/a

| | | | | | | | | | | | | | | |
|---------|--|-------|-------|-------|---------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1.6.5.8 | Perform initial electrical test of readout | | | | | | 5/24/05 | 6/7/05 | \$0 | \$0 | \$544 | \$544 | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
| 9 | MechTechSF | 0.2 | 16 h | 0 w | 5/24/05 | 6/7/05 | \$544 | \$0 | \$0 | \$544 | 0 h | 0 h | 0 h | 16 h |
| 34 | SASEQTestStandF | 1 | 80 h | 0 w | 5/24/05 | 6/7/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 44 | PostDoc | 1.5 | 120 h | 0 w | 5/24/05 | 6/7/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h |
| 47 | Student | 1 | 80 h | 0 w | 5/24/05 | 6/7/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"Perform initial electrical test of readout" continued

Notes

WBS Definition-

Perform electrical tests of L0 readout and certify that specifications are met.

Labor BOE-

Each module will be plugged in to check (1 hour/module), groups of modules will be checked together for 3 days and final tests will be run for 1 week. Need 150% of physicist and a full time student to assist. A mechanical tech is included to help make fine connections at the part time level (2 days).

M&S BOE-

n/a

1.6.5.9 Install outer shell 6/8/05 6/14/05 \$0 \$0 \$1,670 \$1,670

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 9 | MechTechSF | 1 | 40 h | 0 w | 6/8/05 | 6/14/05 | \$1,360 | \$0 | \$0 | \$1,360 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 0.4 | 16 h | 0 w | 6/8/05 | 6/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| 18 | PhysicistU | 0.4 | 16 h | 0 w | 6/8/05 | 6/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |
| 27 | CMMOperatorSF | 0.25 | 10 h | 0 w | 6/8/05 | 6/14/05 | \$310 | \$0 | \$0 | \$310 | 0 h | 0 h | 0 h | 10 h |
| 32 | CMMLarge | 1 | 40 h | 0 w | 6/8/05 | 6/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |

Notes

WBS Definition-

Install the outer carbon fiber shell over the assembled detector.

Labor BOE-

1 week is set aside to install the outer shell, if one is included in the final design. 2 days each of a university and fermilab physicists' time is allotted, as well as a full time MTF. The CMM operator is assumed to be need about 25% of the time, with the CMM itself assumed to be occupied for the entire week.

M&S BOE-

n/a

1.6.5.10 Beams Div bakeout and leak check of beam pipe 5/19/05 6/2/05 \$0 \$0 \$4,520 \$4,520

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|--------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.25 | 20 h | 0 w | 5/19/05 | 6/2/05 | \$1,020 | \$0 | \$0 | \$1,020 | 0 h | 0 h | 0 h | 20 h |
| 8 | MechTechF | 1.25 | 100 h | 0 w | 5/19/05 | 6/2/05 | \$3,500 | \$0 | \$0 | \$3,500 | 0 h | 0 h | 0 h | 100 h |
| 17 | PhysicistF | 0.2 | 16 h | 0 w | 5/19/05 | 6/2/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 16 h |

Notes

WBS Definition-

Bakeout and checkout of the beryllium beam pipe by the beams division to certify its vacuum integrity.

Labor BOE-

100 hours of MTF time over two weeks to perform the bakeout and leak checks; a MEF at 25% to monitor the process and review the results, and assist with any problems that are found; two days of physicist time to review progress and results.

M&S BOE-

n/a

1.6.5.11 SiDet leak check of beam pipe 6/3/05 6/7/05 \$0 \$0 \$1,044 \$1,044

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|------|-------|--------|--------|-------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 0.17 | 4 h | 0 w | 6/3/05 | 6/7/05 | \$204 | \$0 | \$0 | \$204 | 0 h | 0 h | 0 h | 4 h |
| 8 | MechTechF | 1 | 24 h | 0 w | 6/3/05 | 6/7/05 | \$840 | \$0 | \$0 | \$840 | 0 h | 0 h | 0 h | 24 h |
| 17 | PhysicistF | 0.17 | 4 h | 0 w | 6/3/05 | 6/7/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 4 h |

Notes

WBS Definition-

Delivery of the beam pipe to Sidet in preparation for insertion into the Layer 0 detector. The beam pipe is checked again at Sidet for vacuum integrity.

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"SiDet leak check of beam pipe" continued

Notes
Labor BOE-
3 days of MTF checkout at SiDet and a half-day each of review by an MEF and Physicist

M&S BOE-
n/a

1.6.5.12 Install beam pipe 6/15/05 6/15/05 \$5,000 \$0 \$292 \$5,292

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|-----------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 9 | MechTechSF | 0.5 | 4 h | 0 w | 6/15/05 | 6/15/05 | \$136 | \$0 | \$0 | \$136 | 0 h | 0 h | 0 h | 4 h |
| 17 | PhysicistF | 0.5 | 4 h | 0 w | 6/15/05 | 6/15/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 4 h |
| 18 | PhysicistU | 0.5 | 4 h | 0 w | 6/15/05 | 6/15/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 4 h |
| 27 | CMMOperatorSF | 0.25 | 2 h | 0 w | 6/15/05 | 6/15/05 | \$62 | \$0 | \$0 | \$62 | 0 h | 0 h | 0 h | 2 h |
| 28 | CMMProgrammerSF | 0.25 | 2 h | 0 w | 6/15/05 | 6/15/05 | \$94 | \$0 | \$0 | \$94 | 0 h | 0 h | 0 h | 2 h |
| 32 | CMMLarge | 1 | 8 h | 0 w | 6/15/05 | 6/15/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 8 h |
| 48 | MandS | 5,000 | 5,000 | 0 w | 6/15/05 | 6/15/05 | \$5,000 | \$0 | \$0 | \$5,000 | 0 | 0 | 0 | 5,000 |

Notes
WBS Definition-
The Be beam pipe is inserted into the assembled Layer 0 detector.

Labor BOE-
Assumes a CMM in full use for a day, along with a half-day each of two physicists, and a couple of hours each of a CMM operator and programmer

M&S BOE-
\$5000 - installtion fixturing and hardware

1.6.5.13 Test final system 6/16/05 7/14/05 \$0 \$0 \$2,200 \$2,200

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 4 | ElecEngF | 0.25 | 40 h | 0 w | 6/16/05 | 7/14/05 | \$2,200 | \$0 | \$0 | \$2,200 | 0 h | 0 h | 0 h | 40 h |
| 17 | PhysicistF | 0.5 | 80 h | 0 w | 6/16/05 | 7/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 80 h |
| 41 | PostDocF | 1 | 160 h | 0 w | 6/16/05 | 7/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |
| 43 | StudentU | 1 | 160 h | 0 w | 6/16/05 | 7/14/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 160 h |

Notes
WBS Definition-
Final testing and checkout at Sidet prior to declaring the detector ready for installation. Includes electrical and mechanical tests and QA checks, as necessary.

Labor BOE-
A full time post-doc and student as well as 50% of an FNAL physicist and 25% of an EEF for about a month.

M&S BOE-
n/a

1.6.5.14 Layer 0 Silicon Detector Assembly and Testing Co 7/14/05 7/14/05 \$0 \$0 \$0 \$0

Notes
WBS Definition-
Milestone: The layer 0 silicon detector is completely assembled and tested. It is ready to be prepped for shipment to DAB.

1.6.5.15 Prepare for transport to DAB 7/15/05 7/21/05 \$2,000 \$0 \$4,760 \$6,760

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 1 | MechEngF | 1 | 40 h | 0 w | 7/15/05 | 7/21/05 | \$2,040 | \$0 | \$0 | \$2,040 | 0 h | 0 h | 0 h | 40 h |
| 9 | MechTechSF | 2 | 80 h | 0 w | 7/15/05 | 7/21/05 | \$2,720 | \$0 | \$0 | \$2,720 | 0 h | 0 h | 0 h | 80 h |
| 17 | PhysicistF | 1 | 40 h | 0 w | 7/15/05 | 7/21/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 40 h |
| 48 | MandS | 2,000 | 2,000 | 0 w | 7/15/05 | 7/21/05 | \$2,000 | \$0 | \$0 | \$2,000 | 0 | 0 | 0 | 2,000 |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----------|---------|----------|-----------|------------|------------|---------------|---------------|-----------|-----------|---------------|-----------|-----------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|----|-----------|-----|-------|-----|----------|---------|----------|-----|-----|----------|-----|-----|-----|-------|----|------------|-----|---------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|---------|----|---------|-----|---------|-----|----------|---------|-----|-----|-----|-----|-----|-----|-----|---------|----|-------|--------|--------|-----|----------|---------|----------|-----|-----|----------|--|---|---|--------|
| "Prepare for transport to DAB" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>WBS Definition- Move silicon to its shipping fixture, enclose with protective covers, provide any necessary purge gas connections and supplies.</div> <div>Labor BOE- Run2a experience: Need 2 mechanical techs in order to move the detector at any one time. The mechanical engineer assures the procedures will ensure the safety of the detector. The physicist oversees the entire process and checks the engineer's calculations.</div> <div>M&S BOE- \$2000 - for shipping fixtures, covers, etc.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.16 | Layer 0 Silicon Detector Ready to Move to DAB | 7/21/05 | 7/21/05 | \$0 | \$0 | \$0 | \$0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>WBS Definition- Milestone: Layer 0 silicon detector is produced and tested and packaged and ready for shipping to the D0 assembly building for installation into D0.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.17 | Monitoring | 12/17/03 | 7/27/04 | \$24,000 | \$0 | \$0 | \$24,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>Notes</div> <div>WBS Definition- This summary element includes design, production and testing of monitoring systems independent of DAQ readout chain. Currently this includes onlt the temperature monitoring system.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.17.1 | Temperature Monitoring | 12/17/03 | 7/27/04 | \$24,000 | \$0 | \$0 | \$24,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>6</td><td>ElecEngU</td><td>0.3</td><td>360 h</td><td>0 w</td><td>12/17/03</td><td>7/27/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>360 h</td></tr><tr><td>18</td><td>PhysicistU</td><td>0.2</td><td>240 h</td><td>0 w</td><td>12/17/03</td><td>7/27/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>240 h</td></tr><tr><td>47</td><td>Student</td><td>0.1</td><td>120 h</td><td>0 w</td><td>12/17/03</td><td>7/27/04</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>120 h</td></tr><tr><td>48</td><td>MandS</td><td>24,000</td><td>24,000</td><td>0 w</td><td>12/17/03</td><td>7/27/04</td><td>\$24,000</td><td>\$0</td><td>\$0</td><td>\$24,000</td><td></td><td>0</td><td>0</td><td>24,000</td></tr></table> <div>Notes</div> <div>WBS Definition- Includes the design, prototyping, production, and testing for an independent system to read the silicon temperatures on Layer 0.</div> <div>Labor BOE-</div> <div>M&S BOE-</div> | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 6 | ElecEngU | 0.3 | 360 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 360 h | 18 | PhysicistU | 0.2 | 240 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 240 h | 47 | Student | 0.1 | 120 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h | 48 | MandS | 24,000 | 24,000 | 0 w | 12/17/03 | 7/27/04 | \$24,000 | \$0 | \$0 | \$24,000 | | 0 | 0 | 24,000 |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ElecEngU | 0.3 | 360 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 360 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | PhysicistU | 0.2 | 240 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 240 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | Student | 0.1 | 120 h | 0 w | 12/17/03 | 7/27/04 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 120 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | MandS | 24,000 | 24,000 | 0 w | 12/17/03 | 7/27/04 | \$24,000 | \$0 | \$0 | \$24,000 | | 0 | 0 | 24,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.5.18 | Software and Simulation | 11/3/03 | 5/11/05 | \$0 | \$0 | \$42,300 | \$42,300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>19</td><td>CompProfF</td><td>0.3</td><td>900 h</td><td>0 w</td><td>11/3/03</td><td>5/11/05</td><td>\$42,300</td><td>\$0</td><td>\$0</td><td>\$42,300</td><td>0 h</td><td>0 h</td><td>0 h</td><td>900 h</td></tr><tr><td>42</td><td>PostDocU</td><td>1</td><td>3,000 h</td><td>0 w</td><td>11/3/03</td><td>5/11/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>3,000 h</td></tr><tr><td>47</td><td>Student</td><td>1</td><td>3,000 h</td><td>0 w</td><td>11/3/03</td><td>5/11/05</td><td>\$0</td><td>\$0</td><td>\$0</td><td>\$0</td><td>0 h</td><td>0 h</td><td>0 h</td><td>3,000 h</td></tr></table> <div>Notes</div> <div>WBS Definition- The software development needed for the design and commissioning of the Layer 0 silicon detector. It includes the simulation studies to justify our design, the development of codes required for silicon data analysis, calibration and monitoring and the associated design of a new hardware database.</div> <div>Labor BOE- 900 hrs of a computing professional and and one FTE each of a student and postdoc for teh duration of the project.</div> <div>M&S BOE- n/a</div> | | | | | | | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 19 | CompProfF | 0.3 | 900 h | 0 w | 11/3/03 | 5/11/05 | \$42,300 | \$0 | \$0 | \$42,300 | 0 h | 0 h | 0 h | 900 h | 42 | PostDocU | 1 | 3,000 h | 0 w | 11/3/03 | 5/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 3,000 h | 47 | Student | 1 | 3,000 h | 0 w | 11/3/03 | 5/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 3,000 h | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | CompProfF | 0.3 | 900 h | 0 w | 11/3/03 | 5/11/05 | \$42,300 | \$0 | \$0 | \$42,300 | 0 h | 0 h | 0 h | 900 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 42 | PostDocU | 1 | 3,000 h | 0 w | 11/3/03 | 5/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 3,000 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | Student | 1 | 3,000 h | 0 w | 11/3/03 | 5/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 3,000 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-------------------------------------|--|---------|---------|----------|-----------|------------|------------|
| "Software and Simulation" continued | | | | | | | |
| | <u>Notes</u> | | | | | | |
| 1.6.6 | Silicon Project Administration | 11/3/03 | 7/11/05 | \$36,000 | \$0 | \$23,296 | \$59,296 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | The summary task associated with administration of the silicon project including management, travel, shipping, purchasing support, technical support, and software licenses during the project. | | | | | | |
| 1.6.6.1 | Fermilab Administration | 11/3/03 | 7/11/05 | \$25,000 | \$0 | \$23,296 | \$48,296 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | The Fermilab portion of the layer 0 silicon administrative effort. | | | | | | |
| 1.6.6.1.1 | FY04 | 11/3/03 | 9/30/04 | \$15,000 | \$0 | \$12,656 | \$27,656 |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | The FY04 period for Project Administration of the Layer 0 project. | | | | | | |
| 1.6.6.1.1.1 | Project management | 11/3/03 | 9/30/04 | \$0 | \$0 | \$0 | \$0 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 17 PhysicistF 1 1,808 h 0 w 11/3/03 9/30/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 1,808 h | | | | | | |
| | 18 PhysicistU 1 1,808 h 0 w 11/3/03 9/30/04 \$0 \$0 \$0 \$0 0 h 0 h 0 h 1,808 h | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | The management carried out by the Layer 0 silicon project manager and their helpers during FY04. This task accounts for maintenance of the schedule, contacts with the Fermilab directorate, and other administrative time taken. | | | | | | |
| | Labor BOE- | | | | | | |
| | A university and Fermilab physicist as full-time project managers | | | | | | |
| | M&S BOE- | | | | | | |
| | n/a | | | | | | |
| 1.6.6.1.1.2 | Travel | 11/3/03 | 9/30/04 | \$10,000 | \$0 | \$0 | \$10,000 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 48 MandS 10,000 10,000 0 w 11/3/03 9/30/04 \$10,000 \$0 \$0 \$10,000 0 0 0 10,000 | | | | | | |
| | <u>Notes</u> | | | | | | |
| | WBS Definition- | | | | | | |
| | FY04 travel cost associated with the layer 0 silicon project | | | | | | |
| | Labor BOE- | | | | | | |
| | n/a | | | | | | |
| | M&S BOE- | | | | | | |
| | 10 trips at \$1000 per trip= \$10,000 | | | | | | |
| 1.6.6.1.1.3 | Shipping costs | 11/3/03 | 9/30/04 | \$1,000 | \$0 | \$0 | \$1,000 |
| | <u>ID</u> <u>Resource Name</u> <u>Units</u> <u>Work</u> <u>Delay</u> <u>Start</u> <u>Finish</u> <u>Cost</u> <u>Baseline Cost</u> <u>Act. Cost</u> <u>Rem. Cost</u> <u>Ovt. Work</u> <u>Baseline Work</u> <u>Act. Work</u> <u>Rem. Work</u> | | | | | | |
| | 48 MandS 1,000 1,000 0 w 11/3/03 9/30/04 \$1,000 \$0 \$0 \$1,000 0 0 0 1,000 | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | |
|---|--------------------------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|
| "Shipping costs" continued | | | | | | | | | | | | | | |
| <u>Notes</u> WBS Definition- Various detector components must be shipped between and among collaborating institutions and Fermilab. This task covers the shipping costs for those shipments not covered elsewhere in the project. Labor BOE- n/a M&S BOE- | | | | | | | | | | | | | | |
| 1.6.6.1.1.4 | Purchasing support | 11/3/03 | 9/30/04 | \$0 | \$0 | \$6,328 | \$6,328 | | | | | | | |
| <u>ID</u> | <u>Resource Name</u> | <u>Units</u> | <u>Work</u> | <u>Delay</u> | <u>Start</u> | <u>Finish</u> | <u>Cost</u> | <u>Baseline Cost</u> | <u>Act. Cost</u> | <u>Rem. Cost</u> | <u>Ovt. Work</u> | <u>Baseline Work</u> | <u>Act. Work</u> | <u>Rem. Work</u> |
| 26 | AdminAsstF | 0.1 | 180.8 h | 0 w | 11/3/03 | 9/30/04 | \$6,328 | \$0 | \$0 | \$6,328 | 0 h | 0 h | 0 h | 180.8 h |
| <u>Notes</u> WBS Definition- Entering and processing purchasing requisitions including vendor contact time for help with purchasing. Labor BOE- administrative assistant for above work. M&S BOE- n/a | | | | | | | | | | | | | | |
| 1.6.6.1.1.5 | Administrative and technical support | 11/3/03 | 9/30/04 | \$2,500 | \$0 | \$6,328 | \$8,828 | | | | | | | |
| <u>ID</u> | <u>Resource Name</u> | <u>Units</u> | <u>Work</u> | <u>Delay</u> | <u>Start</u> | <u>Finish</u> | <u>Cost</u> | <u>Baseline Cost</u> | <u>Act. Cost</u> | <u>Rem. Cost</u> | <u>Ovt. Work</u> | <u>Baseline Work</u> | <u>Act. Work</u> | <u>Rem. Work</u> |
| 26 | AdminAsstF | 0.1 | 180.8 h | 0 w | 11/3/03 | 9/30/04 | \$6,328 | \$0 | \$0 | \$6,328 | 0 h | 0 h | 0 h | 180.8 h |
| 48 | MandS | 2,500 | 2,500 | 0 w | 11/3/03 | 9/30/04 | \$2,500 | \$0 | \$0 | \$2,500 | | 0 | 0 | 2,500 |
| <u>Notes</u> WBS Definition- Administrative and Technical Support for database entry of components, maintaining travelers, cataloguing, computing and networking support, shipping assistance, maintenance of web based documentation, maintenance of silicon web pages, and the like. Labor BOE- administrative assistant for above effort M&S BOE- 1 pc with software @\$2500 | | | | | | | | | | | | | | |
| 1.6.6.1.1.6 | Software licenses | 11/3/03 | 9/30/04 | \$1,500 | \$0 | \$0 | \$1,500 | | | | | | | |
| <u>ID</u> | <u>Resource Name</u> | <u>Units</u> | <u>Work</u> | <u>Delay</u> | <u>Start</u> | <u>Finish</u> | <u>Cost</u> | <u>Baseline Cost</u> | <u>Act. Cost</u> | <u>Rem. Cost</u> | <u>Ovt. Work</u> | <u>Baseline Work</u> | <u>Act. Work</u> | <u>Rem. Work</u> |
| 48 | MandS | 1,500 | 1,500 | 0 w | 11/3/03 | 9/30/04 | \$1,500 | \$0 | \$0 | \$1,500 | | 0 | 0 | 1,500 |
| <u>Notes</u> WBS Definition- Procurement and/or updates to various software licenses Labor BOE- n/a M&S BOE- 5*\$300 per product=\$1500 | | | | | | | | | | | | | | |
| 1.6.6.1.2 | FY05 | 10/1/04 | 7/11/05 | \$10,000 | \$0 | \$10,640 | \$20,640 | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost |
|-----|------|-------|--------|--------|-----------|------------|------------|
|-----|------|-------|--------|--------|-----------|------------|------------|

"FY05" continued

Notes

The FY05 period for Project Administration of the Layer 0 project.

| | | | | | | | |
|-------------|--------------------|---------|---------|-----|-----|-----|-----|
| 1.6.6.1.2.1 | Project management | 10/1/04 | 7/11/05 | \$0 | \$0 | \$0 | \$0 |
|-------------|--------------------|---------|---------|-----|-----|-----|-----|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|---------|-------|---------|---------|------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 17 | PhysicistF | 1 | 1,520 h | 0 w | 10/1/04 | 7/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 1,520 h |
| 18 | PhysicistU | 1 | 1,520 h | 0 w | 10/1/04 | 7/11/05 | \$0 | \$0 | \$0 | \$0 | 0 h | 0 h | 0 h | 1,520 h |

Notes

WBS Definition-

The management carried out by the Layer 0 silicon project manager and their helpers during FY05. This task accounts for maintenance of the schedule, contacts with the Fermilab directorate, and other administrative time taken.

Labor BOE-

A university and Fermilab physicist as full-time project managers

M&S BOE-

n/a

| | | | | | | | |
|-------------|--------|---------|---------|---------|-----|-----|---------|
| 1.6.6.1.2.2 | Travel | 10/1/04 | 7/11/05 | \$5,000 | \$0 | \$0 | \$5,000 |
|-------------|--------|---------|---------|---------|-----|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 48 | MandS | 5,000 | 5,000 | 0 w | 10/1/04 | 7/11/05 | \$5,000 | \$0 | \$0 | \$5,000 | | 0 | 0 | 5,000 |

Notes

WBS Definition-

FY05 travel cost associated with the layer 0 silicon project

Labor BOE-

n/a

M&S BOE-

5 trips at \$1000 per trip= \$5,000

| | | | | | | | |
|-------------|----------------|---------|---------|---------|-----|-----|---------|
| 1.6.6.1.2.3 | Shipping costs | 10/1/04 | 7/11/05 | \$1,000 | \$0 | \$0 | \$1,000 |
|-------------|----------------|---------|---------|---------|-----|-----|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 48 | MandS | 1,000 | 1,000 | 0 w | 10/1/04 | 7/11/05 | \$1,000 | \$0 | \$0 | \$1,000 | | 0 | 0 | 1,000 |

Notes

WBS Definition-

Various detector components must be shipped between and among collaborating institutions and Fermilab. This task covers the shipping costs for those shipments not covered elsewhere in the project.

Labor BOE-

n/a

M&S BOE-

| | | | | | | | |
|-------------|--------------------|---------|---------|-----|-----|---------|---------|
| 1.6.6.1.2.4 | Purchasing support | 10/1/04 | 7/11/05 | \$0 | \$0 | \$5,320 | \$5,320 |
|-------------|--------------------|---------|---------|-----|-----|---------|---------|

| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work |
|----|---------------|-------|-------|-------|---------|---------|---------|---------------|-----------|-----------|-----------|---------------|-----------|-----------|
| 26 | AdminAsstF | 0.1 | 152 h | 0 w | 10/1/04 | 7/11/05 | \$5,320 | \$0 | \$0 | \$5,320 | 0 h | 0 h | 0 h | 152 h |

Notes

WBS Definition-

Entering and processing purchasing requisitions including vendor contact time for help with purchasing.

Labor BOE-

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | Finish | M&S EQ | M&S Labor | FNAL Labor | Total Cost | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|--|---------|---------------|----------|-----------|------------|------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|-----------|----|------------|-------|-------|-----|---------|---------|---------|-----|-----|---------|-----|-----|-----|-------|----|-------|-------|-------|-----|---------|---------|---------|-----|-----|---------|--|---|---|-------|--|--|--|--|--|--|--|
| "Purchasing support" continued | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> administrative assistant for above work. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | M&S BOE- n/a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.6.1.2.5 | Administrative and technical support | 10/1/04 | 7/11/05 | \$2,500 | \$0 | \$5,320 | \$7,820 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>26</td><td>AdminAsstF</td><td>0.1</td><td>152 h</td><td>0 w</td><td>10/1/04</td><td>7/11/05</td><td>\$5,320</td><td>\$0</td><td>\$0</td><td>\$5,320</td><td>0 h</td><td>0 h</td><td>0 h</td><td>152 h</td></tr><tr><td>48</td><td>MandS</td><td>2,500</td><td>2,500</td><td>0 w</td><td>10/1/04</td><td>7/11/05</td><td>\$2,500</td><td>\$0</td><td>\$0</td><td>\$2,500</td><td></td><td>0</td><td>0</td><td>2,500</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 26 | AdminAsstF | 0.1 | 152 h | 0 w | 10/1/04 | 7/11/05 | \$5,320 | \$0 | \$0 | \$5,320 | 0 h | 0 h | 0 h | 152 h | 48 | MandS | 2,500 | 2,500 | 0 w | 10/1/04 | 7/11/05 | \$2,500 | \$0 | \$0 | \$2,500 | | 0 | 0 | 2,500 | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | AdminAsstF | 0.1 | 152 h | 0 w | 10/1/04 | 7/11/05 | \$5,320 | \$0 | \$0 | \$5,320 | 0 h | 0 h | 0 h | 152 h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | MandS | 2,500 | 2,500 | 0 w | 10/1/04 | 7/11/05 | \$2,500 | \$0 | \$0 | \$2,500 | | 0 | 0 | 2,500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Administrative and Technical Support for database entry of components, maintaining travelers, cataloguing, computing and networking support, shipping assistance, maintenance of web based documentation, maintenance of silicon web pages, and the like. Labor BOE- adminstrative assistant for above effort M&S BOE- 1 pc with software @\$2500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.6.1.2.6 | Software licenses | 10/1/04 | 7/11/05 | \$1,500 | \$0 | \$0 | \$1,500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>48</td><td>MandS</td><td>1,500</td><td>1,500</td><td>0 w</td><td>10/1/04</td><td>7/11/05</td><td>\$1,500</td><td>\$0</td><td>\$0</td><td>\$1,500</td><td></td><td>0</td><td>0</td><td>1,500</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 48 | MandS | 1,500 | 1,500 | 0 w | 10/1/04 | 7/11/05 | \$1,500 | \$0 | \$0 | \$1,500 | | 0 | 0 | 1,500 | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | MandS | 1,500 | 1,500 | 0 w | 10/1/04 | 7/11/05 | \$1,500 | \$0 | \$0 | \$1,500 | | 0 | 0 | 1,500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Procurement and/or updates to various software licenses Labor BOE- n/a M&S BOE- 5*\$300 per product=\$1500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.6.2 | MRI Administrative | 11/3/03 | 9/30/04 | \$11,000 | \$0 | \$0 | \$11,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- Summary task to cover administrative expenses (travel, shipping, etc.) at the listed institutions, not otherwise covered in the schedule. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.6.2.1 | Kansas University Administrative | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>51</td><td>InKind</td><td>3,000</td><td>3,000</td><td>0 w</td><td>11/3/03</td><td>9/30/04</td><td>\$3,000</td><td>\$0</td><td>\$0</td><td>\$3,000</td><td></td><td>0</td><td>0</td><td>3,000</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 51 | InKind | 3,000 | 3,000 | 0 w | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 3,000 | 3,000 | 0 w | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- KU administrative effort (MRI funded) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6.6.2.2 | Kansas State University Administrative | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>ID</th><th>Resource Name</th><th>Units</th><th>Work</th><th>Delay</th><th>Start</th><th>Finish</th><th>Cost</th><th>Baseline Cost</th><th>Act. Cost</th><th>Rem. Cost</th><th>Ovt. Work</th><th>Baseline Work</th><th>Act. Work</th><th>Rem. Work</th></tr><tr><td>51</td><td>InKind</td><td>3,000</td><td>3,000</td><td>0 w</td><td>11/3/03</td><td>9/30/04</td><td>\$3,000</td><td>\$0</td><td>\$0</td><td>\$3,000</td><td></td><td>0</td><td>0</td><td>3,000</td></tr></table> | ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | 51 | InKind | 3,000 | 3,000 | 0 w | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 | | | | | | | | | | | | | | | | | | | | | | |
| ID | Resource Name | Units | Work | Delay | Start | Finish | Cost | Baseline Cost | Act. Cost | Rem. Cost | Ovt. Work | Baseline Work | Act. Work | Rem. Work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | InKind | 3,000 | 3,000 | 0 w | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>Notes</u> WBS Definition- KSU administrative effort (MRI funded) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WBS Dictionary as of 11/3/03
Layer 0 Silicon Schedule

| WBS | Name | Start | | | Finish | | | M&S EQ | | M&S Labor | | FNAL Labor | | Total Cost | |
|-----------|---|----------------------|--------------|-------------|--------------|--------------|---------------|-------------|----------------------|------------------|------------------|------------------|----------------------|------------------|------------------|
| 1.6.6.2.3 | SUNY- Stony Brook Administrative | 11/3/03 | | | 9/30/04 | | | \$2,000 | | \$0 | | \$0 | | \$2,000 | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 51 | InKind | 2,000 | 2,000 | 0 w | 11/3/03 | 9/30/04 | \$2,000 | \$0 | \$0 | \$2,000 | | 0 | 0 | 2,000 |
| | <i>Notes</i> | | | | | | | | | | | | | | |
| | WBS Definition- SUNY-Stony Brook administrative effort (MRI funded) | | | | | | | | | | | | | | |
| 1.6.6.2.4 | University of Washington Administrative | 11/3/03 | | | 9/30/04 | | | \$3,000 | | \$0 | | \$0 | | \$3,000 | |
| | <i>ID</i> | <i>Resource Name</i> | <i>Units</i> | <i>Work</i> | <i>Delay</i> | <i>Start</i> | <i>Finish</i> | <i>Cost</i> | <i>Baseline Cost</i> | <i>Act. Cost</i> | <i>Rem. Cost</i> | <i>Ovt. Work</i> | <i>Baseline Work</i> | <i>Act. Work</i> | <i>Rem. Work</i> |
| | 51 | InKind | 3,000 | 3,000 | 0 d | 11/3/03 | 9/30/04 | \$3,000 | \$0 | \$0 | \$3,000 | | 0 | 0 | 3,000 |
| | <i>Notes</i> | | | | | | | | | | | | | | |
| | WBS Definition- Univ. of Washington administrative effort (MRI funded) | | | | | | | | | | | | | | |